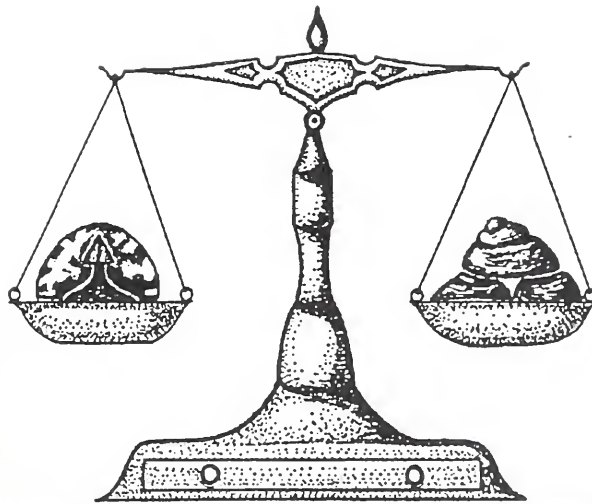


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Copy 2 The Scale



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Editor's Note

If you have items that you would like to have included in the next edition of "The Scale" please send them to the editor no later than January 15, 1998. All contributions are welcome!!!

ISSIS

The Eighth International Symposium of Scale Insect Studies will take place during the week 31st August to 4th September, 1998 at Wye College, Kent, England, arriving on Sunday the 30th August and departing on Saturday 5th September.

The second circular has now been posted to most participants and will have been sent to everyone who was contacted about ISSIS-VII. If you do not receive an invitation in the next few weeks, please contact Dr. Chris Hodgson who will send you another.

Contact address: Dr. Chris Hodgson, Department of Biological Sciences, Wye College, University of London, Ashford, Kent. TN25 5AH. Tel No. 01233 812401; Fax No. 01233 813140; E-mail No. s.briant@wye.ac.uk"

ScaleNet: Providing information on Scale Insects of the World

Many of you may already be aware that because of a grant provided by the Binational Agricultural Research and Development Fund, Yair Ben-Dov, Gary Gibson, and I have been able to establish an information system including systematic data on the scale insects of the world. The data are entered in the catalog database system called BASIS that was developed by Gary Gibson of Agriculture and Agri-Food Canada and then are transported to a World Wide Web site that is available to anyone who has access to the Internet; the URL is "http://www.sel.barc.usda.gov/scalenet.htm". The Web site queries were developed by Richard Carson and Associates. In addition to the web site, fascicles will be published when families are complete and we hope to have CD-ROM accompany the publications. Gary Gibson and Yair Ben-Dov are currently completing conversion of the information on the Coccidae and

Pseudococcidae that has been updated from the hard-copy catalogs (Ben-Dov 1993 and 1994). Currently data at the web site are available on the Conchaspidae, Coccidae, and Eriococcidae and a comprehensive bibliography has been compiled that includes over 9,000 records. Information on the Coccidae is not complete and is not correctly referenced to the ScaleNet bibliography, but these minor problems are currently being rectified. We also realize that the bibliography needs some enhancements and would be grateful if you would look at your area of the references and tell us about errors and omissions. Once we have added the Pseudococcidae and an updated Coccidae, we will begin on the Diaspididae. We hope to complete this family in 1998 and will finish the rest in 1999 or 2000.

To give some idea of the kinds of information that you can obtain from ScaleNet on the Web, we are providing the following examples:

1. You can obtain a catalog for any genus or species of scale (currently a coccid, conchaspid, or eriococcid, but there will be more soon!!)
2. You can find all of the hosts of a particular scale.
3. You could obtain all of the distribution information for a particular scale.
4. You can obtain all of the references that refer to a particular scale.
5. You can obtain a check list of all of the scales that occur in a particular family or genus.
6. You can find all of the scales that occur on a particular host.
7. You can find all of the publications on scale insects that were published between a set of dates.
8. You can produce a list of all of the publications of a particular author.
9. You can produce a list of all of the species or genera described by a particular author.
10. You can produce a list of all references that include up to five words in the title of the article, title of the journal, or in the abstract. For example if you wanted to know all of the papers that include *Maconellicoccus* in the title, journal title, or abstract, you would be given a list of 36 references.

For more detailed information please try ScaleNet with your computer. There is a fairly extensive area providing background information. Give us your thoughts and suggestions.

Obituary of JOSEPH RAYMOND MAMET

Joseph Raymond Mamet, one of the eminent coccidologists of world renown, died on 1st September 1996 aged 84. Raymond, as he liked to be called, was of French ancestry and was born in Mauritius in 1912. He was fluent in French, English and Creole. After gaining a diploma at the college of Agriculture in Mauritius, he became Scientific Assistant in 1934 at the Laboratory of Agricultural Chemistry, Mauritius, where he worked on the control of white grubs (*Clemora smithi*) on sugarcane. He later worked at the Laboratory, Agricultural Entomology of the Agricultural Service, and as Chief Entomologist at the Central Laboratory of the Ministry of Health, studying mainly insects of medical importance and bilharzia. From 1968-1978 he worked in various capacities at the Mauritius Sugar Industry Research Institute and collaborated for many years with John R. Williams.

Raymond had a wide knowledge of agricultural pests and diseases in Mauritius and knew the name of almost every Mauritian plant.

Scale insects became his life-long study. Mauritius had a history of scale insect pests dating back to 1862 when the soft scale *Pulvinaria iceryi* (Signoret) caused widespread damage to sugarcane. By the time Raymond took up his studies of the group, some scale insects of Mauritius had become known through the works of Donald d'Emmerez de Charmoy and A. Daruty de Grandpré towards the end of last century. Raymond published his first paper on scale insects in 1936 and it must have been obvious to scale insect workers at the time that this was of a high standard. Raymond was fortunate to have had E.E. Green, one of the foremost coccidologists of the day, take a keen interest in his work and encourage him through his early studies; help that Raymond always acknowledged. A flow of excellent papers followed on the Coccoidea of Mauritius and other Indian Ocean islands. Raymond also cooperated fully with Alfred Balachowsky in Paris. Through the help and encouragement of Renaud Paulian, then Deputy Director of the Institut de Recherche Scientifique de Madagascar, Raymond started on a series of detailed papers on the Coccoidea of Madagascar, published in five parts from 1950 to 1962. These remain the standard works of this interesting island, which Raymond himself visited in 1950.

Despite his main interest in the Coccoidea of the Indian Ocean, Raymond also published a monograph of the family Conchaspidae of the world and a massive work on 'The *Selenaspidus* Complex' to include all the species known at the time. These works are widely used by agriculturists and scale insect workers. Throughout his working career Raymond also published taxonomic works on Aphidoidea, Aleyrodoidea, Cicadoidea and Thysanoptera, as well as many works on agricultural and medical entomology and crop plants totalling 110 papers.

After his retirement, Raymond became a consultant in Mauritius for the production of Anthurium flowers for export, a new career which he settled down to with renewed vigour.

In 1981, Raymond left Mauritius and lived with his daughter Louisie and family near Paris. Here he worked assiduously on the bibliography of entomology of the Mascarene Islands 1771-1990, published in 1992, followed by another volume in 1993 on the period 1619-1771. Raymond continued working until his death.

I first met Raymond in 1954 during his visit to London with his wife Marie Louise and daughter and we formed a lasting friendship. Unfortunately, his wife died in Mauritius before he retired. Some years ago I was making a list of all scale insect families known to produce honeydew but could find no published information on the family Acleridae. When I met Raymond in Mauritius in 1978 I mentioned this and within ten minutes we were examining *Aclerda takahashii* in the sugarcane fields where we observed honeydew around every insect. He knew exactly where to find any scale insect. Although he spent much of his life controlling insect pests, he was disappointed that he could never find the brilliant pit scale *Asterolecanium specatibile*, on palms anywhere in Mauritius and concluded, unhappily, that it had become extinct. He was very proud of the rows and rows of Anthuriums under his care and took me every day to see them. I met Raymond many times afterwards in Paris.

In 1971 Raymond donated his entire collection of scale insects to the Muséum National d'Histoire Naturelle in Paris, where it is under the care of Danièle Matile and readily available for study.

Raymond was a fine worker and was always ready to help and to give advice. He disliked shoddy work and showed his disapproval of those whom he thought lacked sufficient interest in their work or vocation.

For his scientific achievements, Raymond recieved the prestigious French award of Commandeur dans l'Ordre des Palmes Académiques in 1994. He was truly proud of this and it was surely a well-deserved honour. There are many of us who will miss his help and warm friendship.

D.J. Williams
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NEWS FROM DOUG WILLIAMS

Department of Entomology, The Natural History Museum, Cromwell Road, London SW7 5BD UK.

Work progresses on the mealybugs of southern Asia. This area covers Pakistan in the west to Vietnam and the Philippines in the east. I have already illustrated most of the species described by Green, Newstead, Takahashi and others but fear there may be more than 350 species to describe for the present study. Illustrations completed to date number about 200. I hope that the final work will help anyone in the area to identify these interesting mealybugs and help plant quarantine inspectors everywhere.

There are already large collections in the Natural History Museum, London, which I have studied, but I could not have continued this work satisfactorily without help from colleagues. Dug Miller arranged to let me see the collections housed at Beltsville, and Ray Gill and Lynn Kimsey allowed me to study the collections at Sacramento and Davis, California. Danièle Matile has allowed me to see collections from the area held in Paris, including species from Cambodia and Vietnam and interesting hypogeic mealybugs collected in Sumatra. I have also studied other hypogeic mealybugs from Sabah sent by the Muséum d'Histoire naturelle, Geneva. Sadao Takagi has kindly sent the material he collected in Nepal, India and Malaysia. There are many specimens from Thailand, Malaysia and Sumatra

collected by entomologists working with Ulrich Maschwitz in Frankfurt. These mealybugs include peculiar Allomyrmococcini and other species living in hollow stems, all associated with ants. Evelyn Danzig has sent mealybugs collected in Vietnam, and Penny Gullan has sent all at her disposal including some she has collected recently in Brunei. Ireneo Lit has allowed me to see all the species he has described from the Philippines, and Jack Beardsley sorted specimens from southern Asia and these have now been sent by The Bishop Museum at Honolulu. At present I am working on collections from Thailand.

There have been occasional surprises. For instance, I identified that strange myrmecophilous mealybug, *Xenococcus annandalei* from the Bangalore area of India where it has caused extensive damage recently to grape rootlets and considerable loss of yield. I did not expect 45 species of the difficult *Paraputo* group and hope there are no more.

Hopefully I shall have further news of this study in the next year or so. In the meantime the weight of slides is increasing rapidly.

REPORT FROM KOSZTARAB AT VIRGINIA TECH

Karen Veilleux continues to catalog the aphid and scale insect articles and is heavily involved in locating, entering, and editing reference data for ScaleNet.

Because of delays in printing, I have a backlog of five book chapters on scale insects waiting to be published. An additional article, completed last spring with Penny Gullan, "Adaptations in Scale Insects" appeared in the 1997 volume of the "Annual Review of Entomology." U.S. colleagues can address reprint requests to me; while Penny Gullan, the first author, will supply reprints to people outside of the U.S.

Last April, Matilda and I visited with three of my former graduate students, Drs. Hamon, Lambdin, and Williams, and encouraged them to write a manual on the Scale Insects of the southeastern United States. Toward this goal, I turned over my available illustrations from previous studies at Virginia Tech., as well as my duplicate literature files, to Paris Lambdin, who expressed interest in coordinating the work. Paris already has commitments from a number of would-be contributors. He has two graduate students working on scale insect projects at present.

Visitors this year included Dug Miller, Yair and Yehudith Ben-Dov, and Harlan Hendricks. We are searching for a publisher to print Harlan's Ph.D. dissertation, "A revision of the legless mealybugs, *Serrolecaniini*." [This is a very important piece of work, with many beautiful illustrations, comprehensive analyses of character systems, discovery of a number of new characters, and a phylogenetic analysis. If anyone knows of a possible publisher, please let Michael or Harlan know as soon as possible. I frankly am anxious to have the wonderful information included in this work. Editor]. Suggestions will be appreciated. Since I have "retired," I have no funds for printing.

After my book "Scale insects of northeastern North America" was printed last January, I returned to my "temporarily iced project" the manuscript on my autobiography, "Transylvania Roots." This fall I have completed the first draft on the 21 chapters. Now, I am polishing my "Hungarian-English" text and have been selecting accompanying figures, maps, and photographs. In October, I revisited Transylvania and picked up 30 illustrations to complement my text with folk art and ethnographic subjects, prepared by an artist cousin of mine. Hopefully the book will be printed next July by the local Pocohontas Press. Some of my former colleagues and graduate students may recognize themselves in my writing, but the similarity is only coincidental. Most of the text is telegraphic in style, like scale insect descriptions.

REPORT FROM TAKAGI AT HOKKAIDO

The following is extracted from a letter from Sadao Takagi dated November 14, 1996.

"I retired from my official position at Hokkaidô University on March 31. I will never retire from working on scale insects. A lot of material, including a large number of undescribed species, is at hand, and I feel very happy to have much time to work on it now.

I have restricted my study to armoured scale insects. This study is endless, but I hope to expand my work over other families. Recent publications on the family Pseudococcidae, especially the books written by Dr. D. J. Williams, make this group very attractive to me. I have submitted my mealybug collection from Nepal, India, and Malaysia to Dr. Williams for his study. But, as you know, the Japanese fauna of mealybugs is not yet well known. I hope to begin my work on them in a few years. Best Wishes, TAKAGI Sadao"

REPORT FROM BELTSVILLE

Things have been especially busy this year primarily because of ScaleNet. We have managed to get the contract for the WWW queries pretty well figured out, all of the published bibliography data has been entered into the references database, and the Eriococcidae is nearly complete. The query system was developed and implemented by a very competent team from Richard Carson and Associates, including Arek Grantham, Jane Lemmer, and Robert Todd. The bibliographic data was entered by a series of contractors, but ultimately was the responsibility of Karen Veilleux, in Blacksburg, Virginia. The Eriococcidae data have been entered into the BASIS database and edited by Maren Gimpel. Do I do anything?

Visitors included Chris Hodgson, Roman Jashenko, Michael and Matilda Kosztarab, Svetlana Myartseva, Christopf Stumpf, and Michael Williams.

We continue to work on the database called "Scale" which includes the species in the collection and information on the correct name, the current family assignment, the number of type slides, the total number of slides, the number of boxes of dry specimens. Debra Creel has been working on this project for several years and has it very near completion. We hope ultimately to put this information on the SEL web site as well. It should be useful when submitting a loan request from our collection.

During the year we have been able to publish papers on the Micrococcidae (with Doug Williams), *Trabutina* (with Evelyn Danzig), *Pseudococcus maritimus* complex (with Bill Gimpel), a list of scale insects from Mexico, a discussion of scale insect biodiversity in Mexico (unfortunately reprints are not available), and nomenclatural changes in the Eriococcidae (with Maren Gimpel). If you have not received reprints of any of these please let me know and we will send them to you.

BOOKS OF INTEREST

We have received two books that may be of interest. The first is 1996. **Carl W. Schaefer (Ed.) Studies on Hemiptera Phylogeny. Thomas Say Publications in Entomology: Proceedings, 244 pp.** According to Carl Schaefer "This book began as a symposium at the Eighteenth International Congress of Entomology (Vancouver, 1988), and the contributions have been refined and expanded since. Some of them have been exchanged among the participants, not in an attempt to achieve agreement in conclusions but, rather, that each might know what others are thinking."

He further explains "This book is the first attempt to bring together the ideas of some scholars now studying the evolutionary relationships and higher systematics of Hemiptera ("looking before and after"). The taxonomy of the order has reached a level of maturity that allows broad questions to be asked, tentatively answered, and the answers to be intelligently discussed. This book contributes to that discussion and, I hope, will stimulate more of it."

The chapter are: Origin and evolution of the Coleorrhyncha as shown by the fossil record by Popov and Shcherbakov; Origin and evolution of the Auchenorrhyncha as shown by the fossil record by Shcherbakov; Origins and radiation of the Auchenorrhyncha by Blocker; Scale insects (Homoptera: Coccinea) a day after by Koteja; Cretaceous Homoptera from Brazil: Implications for classification by Hamilton; Some groundplan characters of the Heteroptera by Stys; Comparative external anatomy of the pregenital abdomen of the Hemiptera by Sweet; Role of

polyploidy in the evolution of the Heteroptera by Thomas; Functional wing morphology in the hemipteran systematics by Wootton; Sex pheromones in Homoptera and Hemiptera by Aldrich; and Ventral nerve ganglia coalescence in the embryo: A feasible character for reconstructing the phylogeny of Heteroptera/Paraneoptera by Mori.

At the end of the Introduction Schaefer writes, " Since I wrote the above, and some years after this symposium was first presnted, some of the questions raised here have been addressed, this time from molecular results, not morphological ones. In a series of paper, Sorensen, Campbell, and their colleagues have faced head-on the most basic problems facing himipterists-- problems addressed and discussed in this symposium and summarized above. In these papers (Campbell et al. 1994, 1995; Sorensen et al. 1995) their authors analyzed 18S rDNA nucleotide sequences and concluded among other things that "Homoptera" and "Auchenorrhyncha," as currently defined, are each paraphyletic and, therefore, of little systematic or taxonomic validity. These authors also tentatively confirmed the holophyly of Sternorrhyncha, of Coleorrhyncha-cum-Heteroptera as a single clade, and of each of these groups separately."

Sorensen, Campbell, and others propose and justify the following classification:

Order Hemiptera

Suborder Sternorrhyncha

Psylloidea

Aleyrodiformes

Aphidoidea+Coccoidea

Aleyrodidae

Suborder Clypeorrhyncha (=extant Cicadomorpha)

Suborder Archaeorrhyncha (=Fulgoromorpha)

Suborder Prosorrhyncha

Peloridiomorpha (=Coleorrhyncha)

Heteroptera

The abstract of the article by Koteja is as follows: "An annotated list of 130 scale insect characteristics, which cover morphology, development, genetics, ecology, etc., is provided. The list contains features (character states) considered to be coccid autapomorphies, presumed coccid sister -- perhaps aphid -- group synapomorphies, and selected hemipteran plesiomorphies; apomorphies of all lower taxa (superfamilies, families, etc.) were carefully identified and deleted from the list. Particular attention has been given to features that, although unique within Hemiptera, seem more probably to represent some relict pre-hemipteran plesiomorphies than coccid autapomorphies (e.g., the structure of the antenna and some sense organs). The scale insects are thought here to be a monophyletic group. Within them, Putoidae is considered as ancestor of all neococcids, which comprise > 90% of scale insect species. The remaining 10% are represented by the diverse archeococcids; their interrelationships are obscure, but each of them bears at least some features of the scale insects ancestors; thus they should be an object of hemipterologists' interest in tracing the phylogeny of the bugs."

1996. Kosztarab, M. Scale insects of northeastern North America. Virginia Museum of Natural History, Martinsburg, Virginia, 650 pp. Michael writes "The objectives of this book are to provide: (a) means for the identification of scale insects in Northeastern North

America; (b) information on their biology, life cycle, host plants, natural enemies, distribution, economic importance, and control; and (c) extensive sources of literature for further information.

The book includes information on 12 families, 93 genera, and 254 species. Of these, 14 species overwinter only indoors and are included in the keys. It is the first attempt to cover all the families from this region in one book since the seven atlases of Ferris (1937-1955) were printed. Only two small families (Eriococcidae and Kermesidae) have been updated in recent publications."

RECENT LITERATURE

By Karen Veilleux

Aldrich, J.R. 1996. Sex pheromones in Homoptera and Heteroptera. Pp. 199-233. *in*: Schaefer, C.W., Ed. Thomas Say Publications in Entomology. Proceedings. Studies on Hemipteran Phylogeny. Entomological Society of America, Lanham, MD.

Notes: Pheromone chemistry of Hemiptera is diverse, reflecting the extent of radiation of the group; most hemipteran sex pheromones have been exploited by parasitoids as host-finding kairomones; pheromones are produced by males in taxa characterized by large individuals, and by females in species having relatively small individuals; known examples of acoustical communication in Hemiptera corroborate the pattern of large body size favoring males as the attractive sex; it is suggested that risk of discovery by natural enemies provided the selective driving force for evolution of this pattern; examples of species mentioned include Margarodidae (*Matsucoccus resinosae*, *M. matsumurae*), Diaspididae (*Aonidiella aurantii*, *A. citrina*, *Quadraspidiotus perniciosus*, *Pseudaulacaspis pentagona*, *Epidiaspis leperii*) and Pseudococcidae (*Planococcus citri*, *P. ficus*, *Pseudococcus comstocki*, *P. calceolariae*, *P. maritimus*, *Phenacoccus gossypii*).

Aleksidze, G. 1995. Armored scale insects (Diaspididae), pests of fruit orchards and their control in Republic of Georgia. Israel Journal of Entomology 29: 187-190.

Notes: Review of some important pests of fruit trees: *Quadraspidiotus perniciosus*, *Q. ostraeformis*, *Q. pyri*, *Parlatoria oleae*, *Lepidosaphes ulmi* and *Epidiaspis leperii*; discussion of natural enemies.

Ali, M. 1995. Bionomics of sugarcane mealybug, *Kiritshenkella sacchari* (Green) (Homoptera: Pseudococcidae). Pakistan Journal of Zoology 27: 15-19.

Notes: This mealybug is a parthenogenetically reproducing insect represented by the female; biology; egg laying behavior; morphological variations among nymphs and nymphal behavior.

Allsopp, P.G. & McGill, N.G. 1996. Host-plant resistance: a key component in minimising losses from pink ground pearls. Proceedings of the 1996 Conference of the Australian Society of Sugar Cane Technologists 100-105.

Notes: Conference held at Mackay, Queensland, Australia from 30th April to 3rd May 1996; report on trials of sugarcane cultivars grown at Bundaberg, Queensland, Australia; no insecticide provides effective and useful control of *Eumargarodes laingi*.

Argov, Y., Zchori-Fein, E. & Rosen, D. 1995. Biosystematic studies in the *Aphytis lingnanensis* complex. Israel Journal of Entomology 29: 315-320.

Notes: *Aphytis lingnanensis* is one of the most effective natural enemies of the California red scale, *Aonidiella aurantii* and has been successfully used in the biological control of this important pest; this study attempts to establish the systematic relationships between morphologically identical biparental and uniparental lines of *A. lingnanensis* from different geographical sources; reciprocal crosses were performed between *A. lingnanensis* from California (the type population) and lines from South Africa, Israel, the Philippines (biparental and uniparental), and a mixture of lines from Texas and Hong Kong; results showed that *A. lingnanensis* from California was compatible with all biparental lines but the South African one.

Arias-Reveron, J.M. & Browning, H.W. 1995. Development and mortality of the citrus snow scale (Homoptera: Diaspididae) under constant temperature and relative humidity. *Population Ecology* 24: 1189-1195.

Notes: Citrus snow scale was studied under nine combinations of constant temperature and relative humidity; optimal temperatures for development established; no difference was observed on developmental time between sexes; nonlinear model of development was fit to the stage duration data and a gamma distribution model was fit to the mortality data.

Ascher, K.R.S. & Ben-Dov, Y. 1995. Proceedings of the VII International Symposium of Scale Insect Studies: ISSIS-VII. Entomological Society of Israel, Bet Dagan, Israel. 334 pp.

Notes: Published in *Israel Journal of Entomology*, 1995, Vol. 29. Conference held at the Volcani Center, Agricultural Research Organization, Bet Dagan, Israel, June 12-17, 1994. Papers cover systematics and morphology; zoogeography and faunistics; biology, monitoring and environmental impact; phenology and population dynamics of coccoid pests and their natural enemies; biological and chemical control; and natural enemies -- biology and host interaction.

Beardsley, J.W. 1995. Notes on two *Rhizoecus* species new to the Hawaiian Islands, with a revised key to Hawaiian hypogaeic mealybugs (Homoptera: Pseudococcidae: Rhizoecinae). *Bishop Museum Occasional Papers* 42: 28-29.

Notes: Reports *Rhizoecus cacticans* (Hambleton) and *R. hibisci* Kawai & Takagi as new to Hawaii; key provided to seven hypogaeic mealybugs of the Hawaiian Islands.

Beardsley, J.W. 1995a. Biology and systematics of the Australian genus *Lachnodius* Maskell (Eriococcidae) (Abstract only). *Israel Journal of Entomology* 29: 100.

Notes: Evidence presented to support placement of *Lachnodius* and closely related *Sphaerococcopsis* as a subfamily, the Lachnodiinae, within the Eriococcidae; 23 *Lachnodius* species are known at present, 19 of which are described as new in a revision now in press.

Becker, Hank 1995. Reinventing systematics: Expert systems and DNA fingerprinting are changing how living things are known. *Agricultural Research* May: 4-9.

Notes: Review of research projects at ARS in Beltsville, Maryland; includes brief interview with Douglass Miller, of the Systematic Entomology Lab, among others.

Ben-Dov, Y. & Matile-Ferrero, D. 1995. The identity of the mealybug taxa described by V.A. Signoret (Homoptera, Coccoidea, Pseudococcidae). *Bulletin de la Société Entomologique de France* 100: 241-256.

Notes: Identity of 21 species of Pseudococcidae discussed and established, based on original material and on Signoret's unpublished illustrations; lectotypes designated for several species; new synonymies introduced such as *Dactylopius alaterni*, *D. ceratoniae*, *D. cyperi*

and *D. robiniae* for *Planococcus citri*; *Dactylopius hoyae* for *Pseudococcus longispinus*; and *Dactylopius affinis* for *Pseudococcus viburni*.

Berlinger, M.J., Fallek, C., Dahan, R. & Friedlender, M. 1996. Host-plant relations of the Hall scale (Homoptera: Diaspididae) on peaches and nectarines in Israel. *Journal of Economic Entomology* 89: 1453-1459.

Notes: Population densities of *Nilotaspis halli* throughout a year and on various sites on the host; male nymphs rare and present only in summer.

Berry, J.A. 1995. Moranilini (Insecta: Hymenoptera). No. 33, Fauna of New Zealand/Ko te Aitanga Pepeke o Aotearoa. Manaaki Whenua Press, Lincoln, Canterbury, New Zeal. 82 pp.

Notes: These are predators of mealybug pests such as *Pseudococcus longispinus*, *P. calceolariae* and *P. affinis*; all three are probably Australian; not an economic problem unless the natural enemies presumed to be controlling their populations are disrupted by pesticides; thus Australia is an appropriate place to search for organisms for introduction into New Zealand as biological control agents; other pest coccoid species which have natural enemies within the Moranilini are: *Phenacoccus graminicola*, *Planococcus citri*, *Icerya purchasi* and *Saissetia oleae*.

Blank, R.H., Gill, G.S.C., Olson, M.H. & Upsdell, M.P. 1995. Greedy scale (Homoptera: Diaspididae) phenology on taraire based on Julian day and degree-day accumulations. *Population Ecology* 24: 1569-1575.

Notes: In northern New Zealand, *Hemiberlesia rapax* infests kiwifruit, *Actinidia deliciosa* by aerial invasion from adjacent host plants such as taraire, *Beilschmiedia tarairi*; field populations of this scale were well described by physiological time; therefore, opportunities exist for predicting stage-specific events.

Blank, R.H., Gill, G.S.C. & Olson, M.H. 1995. Seasonal abundance of greedy scale (Homoptera: Diaspididae) and associated parasitoids on Taraire (*Beilschmiedia tarairi*). *Journal of Economic Entomology* 88: 1634-1640.

Notes: *Hemiberlesia rapax* is an important quarantine pest of kiwifruit (*Actinidia deliciosa*); this species invades kiwifruit from adjacent host plants such as taraire; this ecological study observed complex of three parasitoids: *Encarsia citrina*, *Signiphora merceti* and *S. flavella*.

Blank, R.H., Gill, G.S.C. & Upsdell, M.P. 1996. Greedy scale, *Hemiberlesia rapax* (Homoptera: Diaspididae), phenology on kiwifruit leaves and wood. *New Zealand Journal of Crop and Horticultural Science* 24: 239-248.

Notes: Observation of this species for stage-specific phenological information; relationship between relative abundance of each scale stage and Julian day or degree-day accumulation determined using a Bayesian smoothing programme; close agreement between phenology of scale on wood and on leaves.

Blumberg, D. 1995. Parasitoid encapsulation by soft scale insects (Abstract only). *Israel Journal of Entomology* 29: 331.

Notes: Discussion of encapsulation as a defense mechanism of a host insect in response to attack by an internal parasitoid; factors that may affect the frequency of parasitoid encapsulation in soft scale insects.

Blumberg, D. 1995a. Encapsulation of eggs of the encyrtid parasitoid *Metaphycus stanleyi* Compere by the pyriform scale, *Protopulvinaria pyriformis* Cockerell (Coccidae) (Abstract only). *Israel Journal of Entomology* 29: 331.

Notes: This important avocado pest encapsulates eggs of the introduced parasitoid, *M. stanleyi* under both greenhouse and field conditions; rates of encapsulation vary and correlate with ambient temperatures; host plants for this experiment were *Hedera helix* and *Schefflera arboricola*.

Boavida, C., Ahounou, M., Vos, M. Neuenschwander, P. & Van Alphen, J.J.M. 1995. Host stage selection and sex allocation by *Gyranusoidea tebygi* (Hymenoptera: Encyrtidae), a parasitoid of the mango mealybug, *Rastrococcus invadens* (Homoptera: Pseudococcidae). *Biological Control* 5: 487-496.

Notes: The parasitoid reproduced on first, second, and third instars of this mango mealybug, and it avoided hosts that were already parasitized; host feeding was occasionally observed; the implications of this host selection behavior for the biological control of this mealybug are discussed.

Boavida, P. & Neuenschwander, P. 1995. Population dynamics and life tables of the mango mealybug, *Rastrococcus invadens* Williams, and its introduced natural enemy *Gyranusoidea tebygi* Noyes in Benin. *Biocontrol Science and Technology* 5: 489-508.

Notes: This mealybug population's potential rate of increase ranged from 0.066/day to 0.078/day; potential for increase of the parasitoid was double that of its host; seasonal fluctuations in abundance of *R. invadens* were followed from 1988 to 1992 on mango trees in southern Benin; population density of *R. invadens* decreased during the rainy seasons and peaked during the dry seasons.

Boavida, C., Neuenschwander, P. & Herren, H.R. 1995. Experimental assessment of the introduced parasitoid *Gyranusoidea tebygi* Noyes on the mango mealybug *Rastrococcus invadens* Williams, by physical exclusion. *Biological Control* 5: 99-103.

Notes: This experiment utilized paired sleeve cages; in sleeve cages left open to allow parasitoid attack, *G. tebygi* reduced mealybug levels 2.7-fold within 1.5 host generations, compared to the closed-sleeve treatment; parasitism index of 34.4% was measured in the open-sleeve treatment; on leaves without sleeves, the parasitism index was 2-fold higher, and the mealybug population level was two times lower than that in the open-sleeve treatment; rain and wind are additional factors influencing uncaged leaves.

Bokonon-Ganta, A.H. & Neuenschwander, P. 1995. Impact of the biological control agent *Gyranusoidea tebygi* Noyes (Hymenoptera: Encyrtidae) on the mango mealybug, *Rastrococcus invadens* Williams (Homoptera: Pseudococcidae), in Benin. *Biocontrol Science and Technology* 5: 95-107.

Notes: The distribution of *Rastrococcus invadens* among different host plants and its impact on mango growth investigated on more than 2000 trees in three surveys across all ecological zones; *G. tebygi* caused significant decline in infestation.

Bokonon-Ganta, A.H., Neuenschwander, P., Van Alphen, J.J.M. & Vos, M. 1995. Host stage selection and sex allocation by *Anagyrus mangicola* (Hymenoptera: Encyrtidae), a parasitoid of the mango mealybug, *Rastrococcus invadens*. (Homoptera: Pseudococcidae). *Biological Control* 5: 479-486.

Notes: All host instars of this mango mealybug were parasitized; possible impact of *A. mangicola* as a complementary natural enemy of *Gyranusoidea tebygi* discussed.

Bokonon-Ganta, A.H., Van Alphen, J.J.M. & Neuenschwander, P. 1996. Competition between *Gyranusoidea tebygi* and *Anagyrus mangicola*, parasitoids of the mango mealybug,

Rastrococcus invadens: Interspecific host discrimination and larval competition. *Entomologia Experimentalis et Applicata* 79: 179-185.

Notes: No significant differences were found in the way each parasitoid species examined, attacked, stung, and oviposited into hosts, unparasitized, or previously parasitized by the other species; this suggests that neither species discriminates against each other; when *A. mangicola* was the first parasitoid to attack a host, it had no significant advantage over *G. tebygi*; however, when *A. mangicola* followed *G. tebygi* by either 4 or 24 h, it clearly won; overall *G. mangicola* won the competition in 70.9% of all cases; discussion of the coexistence of the two parasitoids as complementary for the biological control of the mango mealybug.

Booth, R.G., Cross, A.E., Fowler, S.V. & Shaw, R.H. 1995. The biology and taxonomy of *Hyperaspis pantherina* (Coleoptera: Coccinellidae) and the classical biological control of its prey, *Orthezia insignis* (Homoptera: Ortheziidae). *Bulletin of Entomological Research* 85: 307-314.

Notes: This scale pest, native to South and Central America, is currently threatening the continued existence of the endemic gumwood tree, *Commidendrum robustum* in St. Helena; this paper hopes to facilitate further use of *H. pantherina* for control.

Boyer, K.E. & Zedler, J.B. 1996. Damage to cordgrass by scale insects in a constructed salt marsh: effects of nitrogen additions. *Estuaries* 19: 1-12

Notes: Because tall cordgrass (*Spartina foliosa*) is needed for nesting by the endangered light-footed clapper rail, managers of constructed salt marshes in southern California are proposing large-scale nitrogen fertilization to improve cordgrass growth; this study examines how this process would affect an existing infestation of *Haliaspis spartina* and the degree of damage this species causes; effects of timing and duration of fertilization on *Haliaspis*; timing of *Haliaspis* dispersal; results show that fertilization did not increase *Haliaspis* population.

Broza, M., Weber, S., Poliakov, D. & Ben-Dov, Y. 1995. Populations of *Rhizoecus* sp. (Pseudococcidae) in post-fire soil of pine forest at Mount Carmel, Israel. *Israel Journal of Entomology* 29: 149-152.

Notes: Description of the ecology of the post-fire soil; the fire reduced the numbers of many soil arthropods, but this uncommon pseudococcid species was highly reproductive and suddenly invaded the area towards the end of the second post-fire year.

Calatayud, P.A., Boher, B., Nicole, M. & Geiger, J.P. 1996. Interactions between cassava mealybug and cassava: cytochemical aspects of plant cell wall modifications. *Entomologia Experimentalis et Applicata* 80: 242-245.

Notes: Paper presented at the Ninth International Symposium on Insect-Plant Relationships held on 24-30 June 1995 in Gwatt, Switzerland; cytochemical evidence is presented that pectinesterase found in salivary secretions of *Phenacoccus manihoti* is associated with the degradation of middle lamellae of cassava.

Calatayud, P.A., Nardon, C. & Rahbe, Y. 1996. A new technique to immobilize an aphid or a mealybug on plants using a high-frequency microcautery unit. *Entomologia Experimentalis et Applicata* 80: 239-241.

- Notes: This new technique was applied to *Macrosiphum albifrons* on lupin (*Lupinus albus*) and *Phenacoccus manihoti* on cassava; high frequency pulse caused death of the insect and complete immobility of the stylets.
- Campbell, B.C., Steffen-Campbell, J.D. & Gill, R.J. 1995. Paraphyly of Homoptera and Auchenorrhyncha inferred from 18S rDNA nucleotide sequences. *Systematic Entomology* 20: 175-194.
- Notes: Evolutionary affiliations of 18 families of Hemiptera are inferred using molecular phylogenetic analysis of nucleotide (nt) sequences of 18S rDNAs; morphological, palaeontomological and eco-evolutionary factors supporting the 18S rDNA-based phylogenetic tree are discussed; *Aonidiella aurantii* on *Laurus nobilis* included.
- Canard, M. 1996. La Pulvinaire pyriforme *Protopulvinaria pyriformis* Cockerell, 1894, une cochenille nouvelle pour la faune de France (Homoptera, Coccidae). [Pyriform scale, *Protopulvinaria pyriformis* Cockerell, 1894, a new scale for the French fauna]. (In French with English summary.) *Bulletin de la Société Entomologique de France* 101: 131-134.
- Notes: This scale found in field in southern France; morphological characters; originally from Spain; hosts include *Hedera helix*.
- Carrillo L., R., Cifuentes C., C. & Mundaca B., N. 1995. [Seasonal cycle of *Lepidosaphes ulmi* (L.) (Hemiptera: Diaspididae).] Ciclo estacional de *Lepidosaphes ulmi* (L.) (Hemiptera: Diaspididae). (In Spanish with English summary.) *Revista Chilena de Entomología* 22: 5-8.
- Notes: This species behaves as monovoltine species in Valdivia province; hibernation at egg stage.
- Charles, J.G., Hill, M.G. & Allan, D.J. 1995. Releases and recoveries of *Chilocorus* spp. (Coleoptera: Coccinellidae) and *Hemisarcophytes* spp. (Acari: Hemisarcophytidae) in kiwifruit orchards: 1987-93. *New Zealand Journal of Zoology* 22: 319-324.
- Notes: Three species of *Chilocorus* and two species of *Hemisarcophytes* were introduced into *Actinidia deliciosa* orchards for armoured scale insect (Diaspididae) control; scale insects hosts include: *Quadraspidiotus nerii*, *Hemiberlesia lataniae* and *H. rapax*.
- Charles, J.G., Hill, M.G. & Allan, D.J. 1995a. Persistence of the predatory mite, *Hemisarcophytes coccophagus* Meyer (Hemisarcophytidae), on low populations of *Hemiberlesia lataniae* Signoret (Diaspididae) in New Zealand. *Israel Journal of Entomology* 29: 297-300.
- Notes: Population fluctuations of *Hemisarcophytes coccophagus* and *Hemiberlesia lataniae* on a row of Lombardy poplar shelter trees were measured, in the absence of any pesticide applications, from the initial establishment of the mite in January 1990 until May 1994; *Hemisarcophytes coccophagus* persisted at one location for nearly 5 years, and showed an ability to contribute to the biological control of *H. lataniae* in the long run, despite the absence of *Chilocorus* spp.
- Christensen, K.M., Whitham, T.G. & Keim, P. 1995. Herbivory and tree mortality across a pinyon pine hybrid zone. *Oecologia* 101: 29-36.
- Notes: *Matsucoccus acalyptus* is among the insects investigated on *Pinus californiarum* and *P. edulis*.
- Clarke, S.R. & DeBarr, G.L. 1996. Impacts of red imported fire ants (Hymenoptera: Formicidae) on striped pine scale (Homoptera: Coccidae) populations. *Journal of Entomological Science* 31: 229-239.

Notes: Loblolly pines (*Pinus taeda*) were banded in 3 seed orchards in Georgia, US, to prevent *Solenopsis invicta* from tending infestations by *Toumeyella pini*; ant activity had no effect on female *T. pini* survival as numbers per shoot were never significantly different between untreated and banded trees in any of the orchards; also, no treatment effects on predator numbers; coincident populations of *Oracella acuta* and *Pseudophilippia quaintancii* on the shoots were also unaffected by the presence of *S. invicta*.

Comstock, J.C. & Lockhard, B.E.L. 1996. Effect of sugarcane bacilliform virus on biomass production of three sugarcane cultivars. Sugar Cane (No. 4): 12-15.

Notes: The mealybug *Saccharicoccus sacchari* was the vector for this virus.

Coronado Blanco, J.M. & Ruiz Cancino, E. 1995. Natural parasitism of citrus snow scale, *Unaspis citri* (Homoptera: Diaspididae), in Tamaulipas, Mexico. Folia Entomologica Mexicana 94: 65-66.

Notes: This citrus pest is found in Argentina, Cuba, U.S., Italy, Russia and Mexico; two *Aphytis* spp. introduced into Florida has proven effective against this scale; other parasitic species are: *Aspidiotiphagus lounsburyi*, *A. citrinus*, *A. proclia*, *A. maculicornis*, *A. mytilaspidis*, *A. chrysomphali*, *A. coheni*, *A. melinus*, *A. lycimnia*, *A. agilior*, and *Arrhenophagus albitibiae*.

Danzig, E.M. 1995. Intraspecific variation in the scale insects (Homoptera: Coccinea). Israel Journal of Entomology 29: 19-24.

Notes: This paper mainly discusses *Parthenolecanium corni*; most important morphological variation is found in the number of submarginal tubercles in adult females and 2nd-instar nymphs; heterogeneity also shown between populations in sex ratio and in the number of generations.

Danzig, E.M. & Przhiboro, A.A. 1995. Coccid fauna (Homoptera, Coccinea) of the intertidal zone of the White Sea. (In Russian with English summary.) Entomologicheskoe Obozrenye 74: 373-375.

Notes: *Acanthococcus* sp., and *Trionymus* sp. were found on above-ground parts of *Agrostis stolonifera*; *Atrococcus cracens* and *Rhizoecus halophilus* were found on roots of *Plantago maritima* and *Leymus arenarius*.

Dentener, P.R., Alexander, S.M., Lester, P.J., Petry, R.J., Maindonald, J.H. & McDonald, R.M. 1996. Hot air treatment for disinfestation of lightbrown apple moth and longtailed mealy bug on persimmons. Postharvest Biology and Technology 8: 143-151.

Notes: Mortality response of fifth instar lightbrown apple moth and *Pseudococcus longispinus* on persimmons to heat treatment; results suggest that this treatment may be as a viable disinfestation method against these pests, which contradicts some previous research.

Dohino, T. & Masaki, S. 1995. Effects of electron beam irradiation on comstock mealybug, *Pseudococcus comstocki* (Kuwana) (Homoptera: Pseudococcidae). Research Bulletin of the Plant Protection Service Japan 31: 31-36.

Notes: Eggs, larvae and mated mature females of comstock mealybugs were irradiated with electron beams in order to determine their radiosensitivities; when the eggs were irradiated, younger eggs were more sensitive than older eggs; larvae irradiated at 0.2 kGy did not grow to maturity; adult females irradiated at 0.2 apprx 0.6 kGy oviposited, but their eggs did not hatch except at 0.2 kGy; descendants, which hatched from eggs irradiated at 0.2

kGy, grew more slowly than the control, and the female descendants still maintained their fecundity.

Dominiak, B.C., McGill, N.G. & Allsopp, P.G. 1996. Evaluation of 10 insecticides against pink ground pearl *Eumargarodes laingi* Jakubski (Hemiptera: Margarodidae). Plant Protection Quarterly 11: 134-136.

Notes: Alpha-cypermethrin at 0.01 g L⁻¹ killed adult females.

Dreistadt, S.H. 1996. Citricola scale (Homoptera: Coccidae) abundance on Chinese hackberry and scale control with spray oil or acephate trunk implants. Journal of Economic Entomology 89: 481-487.

Notes: *Coccus pseudomagnoliarum* was studied infesting *Celtis sinensis*; female scale and crawler densities on untreated trees increased each year; *Parthenolecanium corni*, *P. prunosum* and *Eulecanium cerasorum* also infest Chinese hackberry, but citricola scale was 5-25 times more abundant than the *Parthenolecanium* species combined, and no calico scale were found on sample branches; chemical control methods evaluated.

Dutta, S.K. & Devaiah, M.C. 1995. Morphology of thorax and gaster of *Adelencyrtus (Anabrolepis) mayurai* (Subba Rao) (Hymenoptera: Encyrtidae). Plant Health 1: 39-47.

Notes: Description and illustration of this parasitoid of *Melanaspis glomerata*.

Dymock, J.J. & Holder, P.W. 1996. Nationwide survey of arthropods and molluscs on cut flowers in New Zealand. New Zealand Journal of Crop and Horticultural Science 24: 249-257.

Notes: *Aspidiotus nerii* was found at half the cymbidium sites surveyed.

Ehler, L.E. 1995. Biological control of obscure scale (Homoptera: Diaspididae) in California: an experimental approach. Environmental Entomology 24: 779-795.

Notes: *Melanaspis obscura*, native to U.S., is associated with hosts of *Quercus*, *Carya* and *Castanea*; major pest of pin oak in urban areas and minor pest of pecan; this paper describes the effort to control this scale in Sacramento, California using *Encarsia aurantii*.

Elder, R.J. & Smith, D. 1995. Mass rearing of *Aonidiella orientalis* (Newstead) (Hemiptera: Diaspididae) on butternut gramma. Journal of the Australian Entomological Society 34: 253-254.

Notes: The scale colony is primarily used to reproduce parasitoids for limited release to the pawpaw industry.

Engelhoff, H. 1995. Historical biogeography of the holarctic: area relationships, ancestral areas, and dispersal of non-marine animals. Cladistics 11: 223-263.

Notes: Interrelationships between the four Holarctic infraregions (western and eastern Nearctic, western and eastern Palearctic) are examined; three standard assumptions for biogeographical analysis are compared; Kermesidae is included among the 73 families analysed.

Erkiliç, L. & Uygun, N. 1995. Distribution, population fluctuations and natural enemies of the white peach scale, *Pseudaulecaspis pentagona* (Targioni Tozzetti) (Homoptera: Diaspididae) in the East Mediterranean region of Turkey. Israel Journal of Entomology 29: 191-198.

Notes: This species is a pest of peaches in the East Mediterranean region of Turkey; 14 hosts including several fruit trees, ornamental plants and some herbaceous plants under the canopy of heavily infested peach trees; two parasitoids, *Encarsia berlesei* and *Azotus perspicuosus*, and four predators, *Cybocephalus fodori minor*, *Chilocorus bipustulatus*,

Rhyzobius lophanthae and *Pharoscymnus pharoides* were found; results indicate that the effectiveness of these natural enemies is not sufficient to control the pest.

Foldi, I. 1995. A taxonomic revision of *Limacoccus* Bondar with a cladistic analysis of its relationships with other scale insects (Hemiptera: Coccoidea). *Systematic Entomology* 20: 265-288.

Notes: This genus contains four species that are restricted to the Neotropical area: *L. serratus*, *L. brasiliensis*, *L. kosztarabi* and *L. venezuelana*; these species are adapted to live exclusively on palms (*Astrocaryum macrocalyx*, *Attalea maracaibensis*, *A. speciosa*, *Arecastrum romanzoffianum* and *Orbignya polisticha*); descriptions and illustrations of all instars with sexual dimorphism; discussion of the unique life history of this genus whose second instar female constructs a protective tunnel; as a result of cladistic analysis indicates that this genus is a monophyletic group characterized by seven autapomorphies and is assigned to the family Beesoniidae; redefined family is divided into two tribes: Beesoniini with genera *Beesonia* and *Mangalorea* and Limacocciini with genus *Limacoccus*; the Beesoniidae are here regarded as a sister group of Phoenicoccidae.

Foldi, I. 1995a. [Margarodidae of Mexico (Hemiptera: Coccoidea).] *Margarodidae du Mexique* (Hemiptera: Coccoidea). (In French with English summary.) *Annales de la Société Entomologique de France* 31: 165-178.

Notes: 15 species collected from various biotopes of Mexico (mountains, desert, rain forest, and on cultivated plants); six for Mexico and one genus and four species new to science: *Laurencella*, new gen., *Laurencella marikana*, sp. n. (found associated with ants under a stone on roots of *Acacia pennatula*), *Llaveiella dugmilleri*, *Cryptokermes mimosae* and *Stigmacoccus garmilleri*; descriptions and illustrations; list of 22 Margarodids of Mexico is provided; notes on original binomen, type-locality, distribution and host plants.

Frey, J.E. & Frey, B. 1995. Molecular identification of six species of scale insects (*Quadraspidiotus perniciosus*) by RAPD-PCR: assessing the field-specificity of pheromone traps. *Molecular Cell Biology* 4: 777-780.

Notes: This species is a quarantine pest in Switzerland; occurrence is monitored by trapping males on glue traps treated with artificial female sex pheromone that is supposed to be species-specific; however, large numbers of males were caught in locations where, for ecological reasons, this species was not expected to occur, suggesting that the pheromone is attractive for one or several other scale species; this research tests this hypothesis on six European *Quadraspidiotus* species.

Frey, J.E. & Frey, B. 1995a. Species identification with RAPD-PCR: a determination key for six species of the genus, *Quadraspidiotus* MacGillivray (Diaspididae) (Abstract only). *Israel Journal of Entomology* 29: 100.

Notes: Brief description of development of a molecular determination key and its use.

Garau, R., Prota, V.A., Boscia, D., Fiori, M. & Prota, U. 1995. *Pseudococcus affinis* Mask., new vector of grapevine trichoviruses A and B. *Vitis* 34: 67-68.

Notes: Distribution of this polyphagous pseudococcid mealybug; experiment confirms its ability to transfer viruses from infected grapevines to herbaceous hosts.

Giliomee, J.H. 1995. An annotated key to the families of scale insects (Homoptera: Coccoidea) based on the characters of the adult male. *Israel Journal of Entomology* 29: 11-17.

Notes: Apterous forms of males have not been considered; only more conspicuous and dorsal characters used in constructing the keys; references are given in the keys to publications with additional information; Stictococcidae, Cryptococcidae, Kerriidae, Cerococcidae and Phoenicococcidae are excluded due to insufficient information available.

Gimpel, W.F. & Miller, D.R. 1996. Systematic analysis of the mealybugs in the *Pseudococcus maritimus* complex (Homoptera: Pseudococcidae). Contributions on Entomology, International 2: 1-163.

Notes: Review of 31 species; 18 species are pests of houseplants, ornamentals or agricultural crops; redescrptions; illustrations; hosts; common names; taxonomic notes; synonymy; key to stages and instars, adult females and third instar females; new species include: *Pseudococcus acirculus*, *P. apomicrocirculus*, *P. bermudensis*, *P. bryberia*, *P. dasyliriae*, *P. dolichomelos*, *P. donrileyi*, *P. jackbeardsleyi*, *P. nakaharai*, *P. pithecellobii*, *P. puertoricensis*, *P. schusteri*, *P. solenedyos* and *P. spanocera*.

Golino, D.A., Sim, S.T. & Rowhani, A. 1995. Transmission studies of grapevine leafroll associated virus and grapevine corky bark associated virus by the obscure mealybug. American Journal of Enology and Viticulture 46: 408.

Notes: Abstract of a current study to determine vector capability of California mealybugs (Homoptera: Pseudococcidae) for the transmission of certain grapevine viruses; *Pseudococcus affinis* and two strains of *P. longispinus*, common in California vineyards, were infected with leafroll type III isolate 109; preliminary results indicate that the obscure mealybug, as well as the longtail mealybug, can transmit grapevine corky bark virus, a related closterovirus, at a low rate.

Grafton-Cardwell, E.E. & Reagan, C.A. 1995. Selective use of insecticides for control of armored scale (Homoptera: Diaspididae) in San Joaquin Valley California citrus. Journal of Economic Entomology 88: 1717-1725.

Notes: Recommendations on timing and effectiveness of chemical control of *Aonidiella aurantii* combined with augmentative releases of the scale parasitoid *Aphytis melinus*.

Grassawitz, T.R. & Burts, E.C. 1995. Effect of natural enemies on the population dynamics of the grape mealybug, *Pseudococcus maritimus* (Hom.: Pseudococcidae), in apple and pear orchards. Entomophaga 40: 105-117.

Notes: Techniques of measuring impact included exclusion cages, limb-banding, and visual inspection; natural enemies found were two encyrtid parasitoids *Pseudaphycus websteri* and *Mayridia* sp., a coccinellid *Hyperaspis lateralis*, and a chamaemyiid *Leucopis verticalis*; they provided reasonably good control when insectides had not been used.

Guerrieri, E. 1996. Description of *Microterys seyon* sp. n. (Hymenoptera: Encyrtidae), a parasitoid of *Coccus hesperidum* L. (Homoptera: Coccidae). Bollettino del Laboratorio di Entomologia Agraria 'Filippo Silvestri'. Portici 51: 107-111.

Notes: Description of this parasitoid of the soft brown scale; comparisons to similar species.

Gullan, P.J. & Kosztarab, M. 1997. Adaptations in scale insects. Annual Review of Entomology 42: 23-50.

Notes: Many unusual features of scale insects (Hemiptera: Coccoidea) can be explained as historical legacy. Developmental specializations in ancestral coccoids resulted in a neotenuous adult female and a drastic metamorphosis of the male. Subsequent evolution led to numerous, often convergently derived, adaptations to parasitic life on higher plants.

Discussions of morphological adaptations in females and males, reproductive strategies, life-cycle adaptations, biotic interactions and future research.

Gullan, P.J. & Steward, A.C. 1996. A new genus and species of ant-associated coccid (Hemiptera: Coccidae: Myzolecaniinae) from *Canthium* Lam. (Rubiaceae). *Memoirs of the Queensland Museum* 39: 307-314.

Notes: Description of adult female and first-instar nymph of *Torarchus endocanthium* new gen. and new sp.; this coccid known only from inside hollow, swollen stems (ant domatia) of plants of the genus *Canthium*, where it lives as a trophobiont in the nests of ants of a *Podomyrma* species.

Hadar, D., Wysoki, M. & Rosen, D. 1995. Phenology of the pyriform scale, *Protopulvinaria pyriformis* Cockerell (Coccidae), and distribution of its natural enemies in Israel. *Israel Journal of Entomology* 29: 268.

Notes: This scale has been an important pest of avocado in Israel since 1980; attempt is being made to find a solution that would not interfere with the biological control programs already established in avocado plantations; trials are under way with importations from South Africa, Kenya, Florida, California and Spain of *Metaphycus swirskii*, *M. stanleyi*, *Metaphycus helvolus*, *Pachyneuron concolor*, *Marietta javensis* and *Metaphycus* sp.

Halevy, M., Mendel, Z., Assael, F. & Rosen, D. 1995. Natural enemies and other arthropods associated with *Matsucoccus josephi* (Margarodidae) in Cyprus: an ecological perspective (Abstract only). *Israel Journal of Entomology* 29: 265.

Notes: This Israeli pine bast scale occurs at low densities on *Pinus brutia* ssp. *brutia* in the Eastern Mediterranean; it causes almost no damage to brutia pine, as opposed to the severe decline and mortality it causes to Aleppo pine in Israel; survey of natural enemies and other arthropods associated with the scale was conducted; community structure was determined using indexes for species richness, heterogeneity and species equitability; environmental factors governing species richness were identified; patterns of species abundance were determined and interpreted according to statistically and biologically oriented models.

Hara, A.H., Hata, T.Y. & Hu, B.K.S. 1995. Control of green scale on Cape Jasmine with imidacloprid. *Arthropod Management Tests* 20: 299.

Notes: Efficacy trials conducted on *Coccus viridis* on *Gardenia jasminoides*.

Hara, A.H., Hata, T.Y., Tenbrink, V.L., Hu, B.K. & Kaneko, R.T. 1996. Postharvest heat treatment of red ginger flowers as a possible alternative to chemical insecticidal dip. *Postharvest Biology and Technology* 7: 137-144.

Notes: A postharvest treatment in hot water at 49 degrees C for 12 to 15 min. eliminated >95% of *Technomyrmex albipes*, *Pentalonia nigronervosa* and Pseudococcidae infesting *Alpinia purpurata*; variations of this treatment also discussed.

Hare, J.D. 1996. Priming *Apytis*: behavioral modification of host selection by exposure to a synthetic contact kairomone. *Entomologia Experimentalis et Applicata* 78: 263-269.

Notes: The introduced parasitoid *Aphytis melinus* utilizes a kairomone, O-caffeoyltyrosine, to recognize *Aonidiella aurantii*; wasps used in augmentative release programmes for *A. aurantii* on California citrus are reared on *Aspidiotus nerii*, themselves reared on squash; parasitoids that were removed from their hosts as pupae and allowed to emerge as adults isolated from their hosts retained a strong preference for *A. aurantii* regardless of rearing host; this preference was reduced if parasitoids were allowed to emerge from *A. nerii* thus

acquiring early adult experience with this host; preference for *A. aurantii* was restored, however, by exposing parasitoids reared on *A. nerii* to synthetic O-caffeoyltyrosine prior to bioassay; exposure of *Aphytis melinus* reared in commercial insectaries to O-caffeoyltyrosine prior to release may be a means to improve the effectiveness of such parasitoids in augmentative release programmes to control *Aonidiella aurantii*.

Hattingh, V. 1996. The use of insect growth regulators in integrated pest management of citrus in southern Africa. *Citrus Journal* 6: 14-17.

Notes: Widespread use of certain insect growth regulators, particularly pyriproxyfen, has resulted in outbreaks of previously unimportant pests, and then, the initiation of an insecticide treadmill; availability of pyriproxyfen as an effective control mechanism for organophosphorus-resistant *Aonidiella aurantii* has also been indirectly detrimental to integrated pest management.

Hattingh, V. & Samways, M.J. 1995. Visual and olfactory location of biotopes, prey patches, and individual prey by the ladybeetle *Chilocorus nigritus*. *Entomologia Experimentalis et Applicata* 75: 87-98.

Notes: This predator attacks *Aonidiella aurantii* on citrus in southern Africa and *Asterolecanium miliaris* on *Dendrocalamus giganteus*.

Hattingh, V. & Tate, V. 1995. Effects of field-weathered residues of insect growth regulators on some Coccinellidae (Coleoptera) of economic importance as biocontrol agents. *Bulletin of Entomological Research* 85: 489-493.

Notes: Use of insect growth regulator (IGR) pyriproxyfen (Nemesis) for the control of red scale, *Aonidiella aurantii* (Homoptera: Diaspididae) on citrus in southern Africa has led to extensive disruption of the biocontrol of cottony cushion scale *Icerya purchasi* (Homoptera: Margarodidae) provided by the coccinellids *Rodolia cardinalis* and other indigenous *Rodolia* spp.; results indicate that IGRs are not compatible with integrated pest management (IPM) for citrus in southern Africa.

Havron, A., Rosen, D. & Rubin, A. 1995. Release of pesticide-resistant *Aphytis* strains in Israeli citrus orchards. *Israel Journal of Entomology* 29: 309-313.

Notes: The discovery in Israel of a field population of *Aphytis lingnanensis* (Hymenoptera: Aphelinidae), partially resistant to pesticides, was followed by selection procedures that further increased resistance to azinphosmethyl, x80 relative to a susceptible strain; a field population of *A. melinus* was selected for carbaryl resistance in California; both strains were repeatedly released on populations of *Aonidiella aurantii* infesting commercially managed citrus groves in various parts of Israel; here are reports on release procedures, initial recoveries and their preliminary evaluation.

Helsen, H.H.M., Blommers, L.H.M. & Trapman, M.C. 1996. Timing observation and control of mussel scale *Lepidosaphes ulmi*. *Bulletin SROP* 19: 145-149.

Notes: *Lepidosaphes ulmi* is a locally important pest in apple and pear orchards in the Netherlands; recommendations for optimal time for chemical control.

Henderson, R.C. 1995. Lectotype designations and definitions for five species of New Zealand Coccidae (Hemiptera: Homoptera). *New Zealand Journal of Zoology* 22: 105-108.

Notes: William Maskell's type material of *Ctenochiton perforatus*, *C. elaeocarpi*, *C. fuscus*, *Inglisia leptospermi* and *I. ornata* is reviewed; lectotypes are designated for each species; key characters provided to clarify the original descriptions.

Henderson, R.C. & Hodgson, C.J. 1995. The taxonomic relationships of the Eriococcid genus *Eriochiton* Maskell, with observations on the biology of some species. *Israel Journal of Entomology* 29: 75-83.

Notes: This paper summarizes the features of the adult male and female *Eriochiton* which justified the transference of this genus from the family Coccidae to the family Eriococcidae, despite the presence of a pair of anal plates; ecological discussion.

Hendricks, H.J. 1995. Revision of the tribe Serrolecanini Shinji (Pseudococcidae) with discussion on other legless mealybugs (Abstract only). *Israel Journal of Entomology* 29: 98.

Notes: Definition of legless mealybugs; this research compares morphology of adult females in order to clarify taxonomic placement and to determine their relationships; keys developed.

Herren, H.R. 1996. Cassava and cowpea in Africa. Pp. 136-139 in: Persley, G.J., Ed. *Biotechnology and integrated pest management*. CAB International, Wallingford, UK.

Notes: Two case studies relating to integrated pest management (IPM) in Africa presented; one is the success story of biological control of *Phenacoccus manihoti* on cassava.

Herron, G.A., Beattie, G.A.C., Parkes, R.A. & Barchia, I. 1995. Potter spray tower bioassay of selected citrus pests to petroleum spray oil. *Journal of the Australian Entomological Society* 34: 255-263.

Notes: This technique tested relative susceptibility of selected stages of various citrus pests including *Myzus persicae*, *Saissetia oleae*, *Ceroplastes sinensis*, *Aonidiella aurantii*, *C. destructor* and *C. rubens* to petroleum spray oils.

Higashiura, Y. & Tadauchi, O. 1995. A new record of *Blastothrix longipennis* (Hymenoptera, Encyrtidae) from Japan with a new host record. *Japanese Journal of Entomology* 63: 522.

Notes: *B. longipennis* was reared from *Parthenolecanium pomericum* and *P. corni*; widely distributed in Palearctic and Nearctic.

Hippe, C. & Mani, E. 1995. Flight monitoring of the San Jose scale, *Quadraspidiotus perniciosus* (Comstock) (Diaspididae) and of its parasitoid *Encarsia perniciosi* (Tower) (Aphelinidae) in northwest Switzerland (Abstract only). *Israel Journal of Entomology* 29: 184.

Notes: Isomers that were used in the traps identified; examples of the daily recorded catches with special reference to the effect of evening temperature, wind speed and precipitation.

Hodgson, C.J. 1995. Observations on the structure of the spiracles of adult female Coccidae. *Israel Journal of Entomology* 29: 47-55.

Notes: Basic structure of the spiracle of adult female soft scales described; review of variation found in the Coccidae; small but significant differences in spiracular structure in most subfamilies of soft scales; Myzolecaniinae is an example of a subfamily that is highly variable.

Hodgson, C.J. 1995a. The possible evolution of the plate-like structures associated with the anal area of lecanoid Coccoidea. *Israel Journal of Entomology* 29: 57-65.

Notes: Data presented which strongly support the view of early workers that the anal plates of the Coccidae evolved from anal lobes; fate of anal lobes in other lecanoid families is discussed along with the origin of other plate-like structures associated with the anal area; anal plates in the family Coccidae and the eriococcid tribe Eriochitonini are an example of convergent evolution and, with the possible exception of the Acleridae, the sclerotised plate-like structures found in other lecanoid families have developed in a different manner.

- Hodgson, C.J. & Henderson, R.C. 1996. A review of the *Eriochiton spinosus* (Maskell) species-complex (Eriococcidae: Coccidae), including a phylogenetic analysis of its relationships. *Journal of the Royal Society of New Zealand* 26: 143-204.
- Notes: In addition to *E. spinosus*, about whose status there is still some uncertainty, the complex contains *E. armatus* and five new species: *E. brittini*, *E. deboerae*, *E. dracophylli*, *E. dugdalei* and *E. pseudohispidus*; descriptions, illustrations and diagnostic keys provided for most scale-like stages of all seven species.
- Hu, X., Li, S. & Prokopy, R.J. 1995. Studies on the morphology and taxonomy of the male of *Beesonina napiformis* (Kuwana) (Coccoidea: Beesoniidae). *Israel Journal of Entomology* 29: 85-91.
- Notes: Sexual dimorphism is reported for the first time in species of *Beesonina*, occurring on plants of the Fagaceae; *Beesonina brevipes* is shown to be a junior synonym of *B. napiformis*, since the former has been described from the male form of the first-instar collections taken in China; morphological differentiation of the sexes develops at the beginning of hatching of first instars; all stages of *B. dipterocarpi* are compared with those of *B. napiformis* and reinterpreted; adult male of *Mangalorea*, the only other genus of the Beesoniidae.
- Hu, J.S. & Sether, D.M. 1995. Detection of pineapple closterovirus in pineapple plants and mealybugs using monoclonal antibodies. *Phytopathology* 85: 1137.
- Notes: [Abstract only]; Stable hybridoma cell lines secreting monoclonal antibodies (MAbs) to the pineapple closterovirus (PCV) were produced; PCV was purified from pineapple plants showing typical symptoms of pineapple mealybug wilt; PCV particles were identified by MAbs in ISEM and ELISA in symptomatic and asymptomatic pineapple plants collected from Oahu and Maui, and pineapple collections from USDA-ARS Germplasm Repository in Hilo, but were not detected from pineapple seedlings; at least two serotypes of PCV were detected; in addition, PCV was detected from mealybugs (*Dysmicoccus brevipes*) collected from wilted pineapple plants, but not from the same species of mealybugs collected from a colony raised on squash.
- Itioka, T. & Inoue, T. 1996. The role of predators and attendant ants in the regulation and persistence of a population of the citrus mealybug *Pseudococcus citriculus* in a Satsuma orange orchard. *Applied Entomology and Zoology*. Tokyo 31: 195-202.
- Notes: Results indicate that predators regulate the population of *P. citriculus* and that ant-attendance is indispensable to the persistence of the mealybug populations.
- Itioka, T. & Inoue, T. 1996a. Density-dependent ant attendance and its effects on the parasitism of a honeydew-producing scale insect, *Ceroplastes rubens*. *Oecologia* 106: 448-454.
- Notes: Intensity of attendance of *Lasius niger* estimated at different manipulated densities in a citrus orchard in Honshu, Japan.
- Itioka, T. & Inoue, T. 1996b. The consequences of ant-attendance to the biological control of the red wax scale insect *Ceroplastes rubens* by *Anicetus beneficus*. *Journal of Applied Ecology* 33: 609-618.
- Notes: Ant exclusion experiments in a satsuma orchard in Honshu, Japan; parasitoids frequently observed to interrupt their ovipositional behaviour due to interactions with ants attending host aggregations; ant attendance caused decrease in percentage of parasitism and consequently an increase in the growth rate of the host populations.

- Izhaki, I. & Ne'eman, G. 1996. The effect of porcupine and bast scale on Aleppo pine recruitment after fire. *Acta Oecologica, Oecologia Applicata* 17: 97-107.
- Notes: Bast scale *Matsucoccus josephi* damage was widespread and affected saplings over a wide range of ages; results indicate that success of scales was encouraged by harsh post-fire conditions.
- Izraylevich, S. & Gerson, U. 1995. Sex ratio of *Hemisarcoptes coccophagus*, a mite parasitic on insects: density-dependent processes. *Oikos* 74: 439-446.
- Notes: Hosts for this species include *Parlatoria pergandii*, *P. cineria* (usually on orange and grapefruit), and *Hemiberlesia lataniae* and *Aspidiotus nerii* (found on *Acacia cyanophylla*; lab experiments were conducted with this parasite maintained on *Diaspis echinocacti* reared on *Opuntia* sp.
- Izraylevich, S. & Gerson, U. 1995a. Host scale effects on the parasitic mite *Hemisarcoptes coccophagus* Meyer and their implications for the biological control of Diaspidid pests. *Israel Journal of Entomology* 29: 291-296.
- Notes: This experiment demonstrates that different scale stages, species and host plants have a pronounced effect on the parasitization patterns of the mites, implying that these factors should be considered in biological control programs.
- Izraylevich, S. & Gerson, U. 1995b. Spatial patterns of the parasitic mite *Hemisarcoptes coccophagus* (Astigmata: Hemisarcoptidae): host effect, density-dependence of aggregation, and implications for biological control. *Bulletin of Entomological Research* 85: 235-240.
- Notes: Results show that spatial distribution of this mite on *Hemiberlesia lataniae* and *Aspidiotus nerii* was highly aggregated in the field.
- Izraylevich, S., Gerson, U. & Hasson, O. 1996. Numerical response of a parasitic mite: host effect and mechanism. *Environmental Entomology* 25: 390-395.
- Notes: Populations of the mite *Hemisarcoptes coccophagus* parasitizing two species of armoured scale insects were sampled over one year in Israel; mite responded faster to the density of *H. lataniae* than to the density of *A. nerii*.
- Izraylevich, S., Gerson, U. & Wysoki, M. 1995. Karyotype and the sex determining mechanism of the mite *Hemisarcoptes coccophagus* Meyer (Acariformes: Astigmata: Hemisarcoptidae) *International Journal of Acarology* 21: 229-232.
- Notes: *H. coccophagus* is a parasite of armored scale insects (Homoptera: Diaspididae); for this experiment colonies were maintained on the cactus scale, *Diaspis echinocacti*, reared on field collected pods of *Opuntia* sp.
- Jactel, H., Perthuisot, N., Menassieu, P. & Einhorn, J. 1995. Monitoring populations of the maritime pine scale, *Matsucoccus feytaudi* Ducasse (Margarodidae), using sex pheromone trap: a preliminary study (Abstract only). *Israel Journal of Entomology* 29: 184.
- Notes: Number of males of this species caught in traps was compared with number of exuviae per tree (*Pinus pinaster*) to determine accuracy of pheromone trapping in estimating population; number of exuviae per tree correlated significantly with the average number of males caught in the same plot only for the 30 microgram dose in middle-aged plantations; recommendations made for sexual trapping as a monitoring method for *M. feytaudi*.
- Jahn, G.C. & Beardsley, J.W. 1996. Effects of *Pheidole megacephala* (Hymenoptera: Formicidae) on survival and dispersal of *Dysmicoccus neobrevipes* (Homoptera: Pseudococcidae). *Journal of Economic Entomology* 89: 1124-1129.

Notes: Results suggest that in the absence of natural enemies and inclement weather, *P. megacephala* does not cause an increase in mealybug population size, that ants do not move *D. neobrevipes* from pineapple to pineapple, and that the removal of honeydew by *P. megacephala* does not benefit *D. neobrevipes*.

Jaiswal, A.K. & Saha, S.K. 1995. Estimation of the population of parasitoids associated with lac insect, *Kerria lacca* Kerr. on the basis of biometrical characters. Journal of Entomological Research. New Delhi 19: 27-32.

Notes: Relationships between density of *K. lacca*, number of shoots with lac and length of lac encrustation on each shoot with incidence of three major parasitoids associated with lac were examined and regression equations developed; density of lac insect was the only character that explained significant variation in the population of its parasitoids.

Jalali, S.K. & Singh, S.P. 1995. Effect of pesticide on mortality and parasitizing ability of parasitoid *Aphytis* species of San Jose scale (*Quadraspidiotus perniciosus*). Indian Journal of Agricultural Sciences 65: 617-620.

Notes: Testing of 10 pesticides on *Aphytis* spp and their influence on parasitism of *Q. perniciosus*.

Jansen, M.G.M. 1995. Scale insects (Homoptera: Coccinea) from import interceptions and greenhouses in the Netherlands. Israel Journal of Entomology 29: 131-146.

Notes: List of the species of Coccinea which have been intercepted on plants imported into the Netherlands during the period 1950-1994; host plants; country of origin; year of first interception; list and data on scale insects that occur in greenhouses in the Netherlands.

Jefferson, D.K. & Schultz, P.B. 1995. Differential susceptibility of six *Euonymus* species and cultivars to Euonymus scale, *Unaspis euonymi* (Comstock). Journal of Environmental Horticulture 13: 140-142.

Notes: Significantly lower levels of euonymus scale were observed on *Euonymus kiautschovicus* 'Manhattan', *E. japonicus*, and *E. fortunei* in the field studies; in contrast, *E. japonicus* 'Albo-marginatus' and *E. japonicus* 'Microphyllus' had the highest infestation levels, indicating greater susceptibility to euonymus; in container studies, *E. japonicus* 'Albo-marginatus' was the most susceptible of the species and cultivars; however, none of the remaining five differed significantly from one another.

Joshi, P.A. & Lambdin, P.L. 1996. The ultrastructure of hemocytes in *Dactylopius confusus* (Cockerell), and the role of granulocytes in the synthesis of cochineal dye. Protoplasma 192: 199-216.

Notes: The ultra structural study of free circulating hemocytes in the adult cochineal scale demonstrated five cell types: prohemocytes, typical granulocytes (T-granulocytes), oenocytoids, plasmatocytes, and agranulocytes with modified sub-cellular structure to perform a special synthetic and secretory function, which we refer to as "modified granulocytes with modified sub-cellular structure to perform a special synthetic and secretory function, which we refer to as "modified granulocytes" (M-granulocytes); characteristics and illustrations of each cell type.

Jothi, B.D. & Tandon, P.L. 1995. Present status of insects of ber in Karnataka. Current Research -- University of Agricultural Sciences (Bangalore) 24: 153-155.

Notes: Survey of insect pests of ber (*Ziziphus mauritiana*) revealed Coccidae among the minor species.

- Kapadia, M.N., Parsana, G.J. & Butani, P.G. 1995. Field recovery of *Anagyrus punctulatus* Agarwal, a parasitoid of the sugarcane mealybug. *Indian Sugar* 45: 361-362.
Notes: Among five parasitoids of *Saccharicoccus sacchari*, the encyrtid *Anagyrus punctulatus* (*Anagyrus diversicornis*) was found to be the most important parasitoid in regulating the pest population in sugarcane; adults of parasitoid were released in sugarcane fields during 1991-93; overall parasitism was 56.7% compared with 31.7% in the control.
- Katsoyannos, P. & Stathas, G.J. 1995. Phenology, embryonic diapause and importance of natural enemies of *Lepidosaphes ulmi* (L.) (Homoptera: Diaspididae) on olive trees in Greece. *Israel Journal of Entomology* 29: 199-206.
Notes: Biological notes; effectiveness of two predators: *Hemisarcophaga malus* and *Cybocephalus fodori*.
- Kazandjiev, V., Tzalev, M. & Staneva, E. 1995. Reproduction of San Jose scale (*Quadraspidiotus perniciosus* Comst.; Homoptera: Diaspididae) in Bulgaria in dependence of the thermal conditions. *Bulgarian Journal of Agricultural Science* 1: 247-252.
Notes: Range of temperatures established in which this scale can develop.
- Kosztarab, M. 1996. Scale insects of Northeastern North America. Identification, biology, and distribution. Virginia Museum of Natural History, Martinsburg, Virginia. 650 pp.
Notes: Includes descriptions, illustrations, keys, and pertinent taxonomic data on about 240 species that occur outdoors; indices to distribution in northeastern North America, host plants, natural enemies (as well as ants and other associated organisms), and scale insect taxa by scientific and common names; 34 pages of references.
- Kosztarab, M. & Rhoades, M. 1995. Coccinea (Homoptera) of northeastern North America. *Israel Journal of Entomology* 29: 109-112.
Notes: Discusses scope and content of this subsequently published identification manual for Coccinea of northeastern North America.
- Koteja, J. 1996. Cataloguing fossil scale insects (Homoptera, Coccinea). *Inclusion Wrostek* 22: 2.
Notes: The importance of the cataloguing step in studying fossil scale insects.
- Koteja, J. 1996a. Scale insects (Homoptera: Coccinea) a day after. Pp. 65-88. *in*: Schaefer, C.W. Thomas Say Publications in Entomology. Proceedings. Studies on Hemipteran Phylogeny. Entomological Society of America, Lanham, MD. 244 pp.
Notes: An annotated list of 130 scale insect characteristics, which cover morphology, development, genetics, ecology, etc., is provided; the list contains features (character states) considered to be coccid autapomorphies, presumed coccid sister--perhaps aphid--group synapomorphies, and selected hemipteran plesiomorphies; apomorphies of all lower taxa were identified and deleted; scale insects are considered here to be a monophyletic group; within them, Putoidae is considered as ancestor of all neococcids, which comprise >90% of scale insect species.
- Kozár, F. 1995. New data on the zoogeography of Palearctic Coccoidea (Homoptera). *Israel Journal of Entomology* 29: 103-108.
Notes: An analysis of zoogeographical data for the Coccoidea of the Palearctic region showed that the largest number of local species was found in the Far-Eastern and Mediterranean subregions; numbers of genera restricted to one or two subregions given; similarities among regions; density of species in one square kilometer compared.

Kozár, F. 1995a. Geographical segregation of scale-insects (Homoptera: Coccoidea) on fruit trees and the role of host plant ranges. *Acta Zoologica Academiae Scientiarum Hungaricae* 41: 315-325.

Notes: 21 scale species found only in a narrow zone of this widely studied geographic region (central and eastern Europe); scales divided into armoured and soft scale guilds on the basis of frequency, density and differences in microhabitat specialization; armoured scales are further divided into four geographical subguilds, as Eurosiberian, middle- and south-European, invader and Mediterranean on the basis of size of distribution, northern limit of distribution, frequency and density in samples; total host plant range had no effect on the total size of distribution of the studied species.

Kozár, F. & Benedicty, Zs. K. 1995. New data on the swarming of San José scale [*Quadraspidiotus perniciosus* (Comstock, 1881) Hom.: Coccoidea] males and scale parasitoids. (In Hungarian with English summary.) *Növényvédelem* 32: 499-506.

Notes: Value of pheromone traps in studying flight of San José scale males, even at low individual densities; traps also caught adults of endoparasitoid *Encarsia perniciosi*; *Epidiaspis leperii* (red pear scale) and the ectoparasitoid *Aphytis proclia* also occurred in these orchards; planting of nectariferous plants failed to increase density of parasitoids.

Kozár, F. & El Fatah, S.D. 1996. Recent data to the knowledge of the Japanese mulberry scale (*Pseudaulacaspis pentagona* Targioni-Tozzetti 1886) (Homoptera: Coccoidea). (In Hungarian with English summary.) *Növényvédelem* 32: 111-118.

Notes: Discussion of increasing distribution of this species in Hungary as revealed by pheromone trapping; *Encarsia berlesei* was found to be the most effective natural enemy, but use of chemical control methods recommended.

Kozár, F. & Franco, J.C. 1995. Some new data to the scale insect fauna (Homoptera: Coccoidea) from Continental Portugal. *Folia Entomologica Hungarica* 56: 69-74.

Notes: This survey revealed the existence of 30 species from seven families; species recorded for the first time in Portugal are: *Kuwania rubra*, *Atrococcus paludinus*, *Balanococcus scirpi*, *Trionymus perrisii*, *Vryburgia amaryllidis*, *Acanthococcus roboris*, *Gossyparia spuria*, *Pseudochermes fraxini*, *Parafairmairia gracilis*, *Rhizopulvinaria maritima*, *Asterodiaspis quercicola* and *Unaspis citri*; total number of known scale species in Portugal is now 99.

Kozár, F., Hippe, C. & Mani, E. 1996. Morphometric analyses of the males of *Quadraspidiotus* species (Hom., Diaspididae) found in European orchards or their vicinity. *Journal of Applied Entomology* 120: 433-437.

Notes: Morphological characteristics (antenna, scutellum) of the males of *Quadraspidiotus gigas*, *Q. marani*, *Q. ostreaeformis*, *Q. perniciosus*, *Q. pyri*, and *Q. zonatus* were analyzed; identification of distinct characters useful for differentiation of species.

Kozár, F., Sheble, D.A.F. & Fowjhan, M.A. 1995. Study on the further spread of *Pseudaulacaspis pentagona* (Homoptera: Coccoidea: Diaspididae) in central Europe. *Israel Journal of Entomology* 29: 161-164.

Notes: Northward expansion of this white peach scale has been observed in Hungary during the last 20 years; this survey included observations on *Morus*, *Sophora*, and *Syringa* in 119 sites in Austria, Bulgaria, Hungary, Romania and Slovakia; pheromone traps used in some sites; 60 sites infested found to be infested; density varied.

Kozarzhevskaya, E. 1995. Scale insects (Homoptera: Coccoidea) of coniferous plants in the parks of Russia (Abstract only). *Israel Journal of Entomology* 29: 157.

Notes: 150 species known to occur on coniferous trees throughout the world; species that commonly attack conifers in urban areas of Russia include: *Physokermes hemicryphus* and *Ph. piceae* on spruce; *Nuculaspis abietis*, *Leucaspis loewi*, *L. pusilla* and *Lepidosaphes newsteadi* on pine; *Parthenolecanium fletcheri*, *Carulaspis carueli*, *C. juniperi* and *Lepidosaphes juniperi* on Thuja, *Parthenolecanium pomeranicum* on *Taxus* spp.; *Phenacoccus piceae* on ornamental spruce; *Planococcus vovae* on ornamental *Juniperus*; summary of types of damage caused.

Krishnamoorthy, A. & Rajagopal, D. 1995. Comparative toxicity of pesticides to natural enemies of California red scale, *Aonidiella aurantii* Maskell). *Pest Management in Horticultural Ecosystems* 1: 71-79.

Notes: Several pesticides commonly used on citrus and rose were screened for their toxicity to four important natural enemies of *Aonidiella aurantii*, namely *Aphytis melinus*, *Chilocorus nigrita*, *Pharoscymnus horni* and *Eryngiopus* sp.; natural enemies were exposed to pesticide-treated leaf surface on the day of application and subsequently at 7-day intervals to determine the immediate and residual toxicities; the botanical insecticides, neem oil, pongamia oil and mahua oil, the acaricides dicofol and sulfur and fungicides copper oxychloride and maneb were safer to *A. melinus*, *C. nigrita* and *P. horni*, while the acaricides were toxic to the predatory mite *Eryngiopus* sp.; among 11 insecticides tested, only chlorpyrifos and dichlorvos were found to be comparatively less toxic.

Labuschagne, T. 1995. The road to biocontrol of the mango scale. *Inglistingsbulletin -- Instituut vir Propie en Subtropiese Gewasse* (No. 276): 1-3.

Notes: Brief outline of the use of *Aphytis* sp. for control of *Aulacaspis tubercularis* on mango.

Labuschagne, T.I., van Hamburg, H. & Froneman, I.J. 1995. Population dynamics of the mango scale, *Aulacaspis tubercularis* (Newstead) (Coccoidea: Diaspididae), in South Africa. *Israel Journal of Entomology* 29: 207-217.

Notes: Ecological aspects such as population composition, population fluctuation and spatial distribution as well as the natural enemies of this species were analyzed using data gathered from two localities; indigenous parasite *Encarsia citrina* was incapable of controlling this scale despite the percentage of parasitism exceeding 80% at certain times of the year, the predatory thrips, *Aleurodothrips fasciapennis*, was probably recorded for the first time in Africa while preying on the mango scale.

Lambdin, P.L. 1995. Release, development and establishment of *Chilocorus kuwanae* Silvestri for control of *Unaspis euonymi* (Comstock) in Tennessee. *Israel Journal of Entomology* 29: 327-330.

Notes: Development and survival of the egg predator *Chilocorus kuwanae* (the Korean lady beetle) were higher on *Unaspis euonymi* than on eggs of *Chionaspis pinifoliae* or *Chionaspis salicisnigrae*; ovipositional behavior.

Lampson, L.J., Morse, J.G. & Luck, R.F. 1996. Host selection, sex allocation, and host feeding by *Metaphycus helvolus* (Hymenoptera: Encyrtidae) on *Saissetia oleae* (Homoptera: Coccidae) and its effect on parasitoid size, sex, and quality. *Environmental Entomology* 25: 283-294

Notes: Black scale growth ceased following parasitization by *Metaphycus helvolus*; with insectary-parasitized hosts, both male and female parasitoid size increased with increasing host size; average host size in a laboratory study was larger and no clear host-parasitoid size relationship resulted; for both lab and insectary-parasitized hosts, host scale size from which male offspring emerged was significantly smaller than those from which females emerged; effect of parasitoid size on several measures of progeny reproductive fitness was examined under lab conditions; larger parasitoids of both sexes had longer life spans, with male longevity more strongly affected by size than female longevity; four-day egg complement was correlated with parasitoid size, with large females producing approximately twice as many eggs as small females.

Le Ru, B., Renard, S., Allo, M., Le Lannic, J. & Rolland, J.P. 1995. Antennal sensilla and their possible functions in the host-plant selection behaviour of *Phenacoccus manihoti* (Matile-Ferrero) (Homoptera: Pseudococcidae). International Journal of Insect Morphology and Embryology 24: 375-389.

Notes: Nine different types of sensilla have been identified on the antenna of the cassava mealybug *Phenacoccus manihoti* (Homoptera: Pseudococcidae) with scanning and transmission electron microscopes; results indicate that this mealybug has sensory equipment on its antennae that can detect, by olfaction and contact, chemicals released by the plant.

Lester, P.J., Dentener, P.R., Petry, R.J. & Alexander, S.M. 1995. Hot-water immersion for disinfestation of lightbrown apple moth (*Epiphyas postvittana*) and longtailed mealy bug (*Pseudococcus longispinus*) on persimmons. Postharvest Biology and Technology 6: 349-356.

Notes: Mortality response of lightbrown apple moth and longtailed mealybug examined; lower mortality was found under the calyx compared to that on the outside of the fruit; hot-water immersion appears to be a potentially useful disinfestation technique.

Lo, P.L. 1995. Size and fecundity of soft wax scale (*Ceroplastes destructor*) and Chinese wax scale (*C. sinensis*) (Homoptera: Coccidae) on citrus. New Zealand Entomologist 18: 63-69.

Notes: Adult soft wax scale and Chinese wax scale infesting citrus orchards in Northland, New Zealand were sampled to determine their size, fecundity and the proportion of crawlers emerging; both species had similar power regressions between scale size and fecundity; both size and density of adults need to be measured to estimate egg production of scale populations; the proportion of eggs that emerged as crawlers averaged 60% for soft wax scale and 76% in Chinese wax scale; *Tyrophagus perniciosus* mites were present under most scales with dead eggs and/or dead crawlers, but were absent where most crawlers had emerged.

Longo, S., Marotta, S., Pellizzari, G., Russo, A. & Tranfaglia, A. 1995. An annotated list of the scale insects (Homoptera: Coccoidea) of Italy. Israel Journal of Entomology 29: 113-130.

Notes: A list of the 343 species of scale insects recorded in Italy until 1993; species belong to 14 families; most numerous are the Pseudococcidae - 114 species, Diaspididae - 114 species and the Coccidae (50 species); data given on their distribution throughout the Italian territory; information on introduced and acclimatized species; *Acanthococcus rosannae* is transferred from *Eriococcus*.

Longo, S., Mazzeo, G. & Russo, A. 1995. Biological observations on some scale insects (Homoptera: Coccoidea) in Sicily. Israel Journal of Entomology 29: 219-222.

- Notes: Notes on *Phenacoccus madeirensis*, *Ph. silvanae* and *Scythia aetnensis*; biology; natural enemies.
- Luna-Salas, J.F. & Martinez-Shio, M.E. 1995. Scale insects on citrus in central Tamaulipas, Mexico (Abstract only). *Israel Journal of Entomology* 29: 265.
- Notes: Survey of pests of citrus revealed *Aonidiella aurantii* as the most common species, *Lepidosaphes gloverii* as the second most common; other less common species were *Icerya purchasi*, *Chrysomphalus aonidum* and *Saissetia oleae*.
- Mani, M. 1995. Studies of the natural enemies of the wax scale *Drepanococcus chiton* (Green) on ber and guava. *Entomon* 20: 55-58.
- Notes: Survey of natural enemies revealed *Anicetus ceylonensis*, *Diversinervus elegans*, *Metaphycus* nr. *helvolus*, *M. sp. B. nr. helvolus*, *Philosindia* sp. nr. *longicornis*, *Cephaleta brunniventris*, *Chilocorus nigrita*, *Cryptolaemus montrouzieri*, *Menochilus sexmaculata* and *Scymnus*.
- Mani, M., Krishnamoorthy, A. & Pattar, G.L. 1995. Biological control of the mango mealybug, *Rastrococcus iceryoides* (Green) (Homoptera: Pseudococcidae). *Pest Management in Horticultural Ecosystems* 1: 15-20.
- Notes: Studies conducted on the natural enemy complex of this mealybug and the predatory potential of *Cryptolaemus montrouzieri*; seven species of natural enemies were observed parasitizing/predating on the host; effect of the release of *C. montrouzieri* on mealybug infestation of 16 mango varieties.
- Marotta, S. 1995. [Two species of *Rhizoecus* Kunckel d'Herculais, 1878 (Homoptera: Coccoidea Pseudococcidae) new for the Italian fauna] Due *Rhizoecus* Kunckel d'Herculais, 1878 (Homoptera Coccoidea Pseudococcidae) nuovi per la fauna italiana. (In Italian with English summary.) *Bollettino di Zoologia Agraria e Bachicoltura*. Milano Ser. II, 27: 117-121.
- Notes: *Rhizoecus dianthi* collected on roots of African violets; *R. latus* was collected on roots of *Ficus benjamina*; morphology; taxonomy; geographical distribution; key to identification of the Italian *Rhizoecus* provided.
- Marotta, S. & Tranfaglia, A. 1995a. Variability of morphological characters and its use in the systematics of mealybugs (Homoptera: Pseudococcidae). *Israel Journal of Entomology* 29: 67-73.
- Notes: Intraspecific variations in morphological characters are common in mealybugs; their incorrect or superficial interpretation has often led to proliferation of synonyms and neglect of studies on the possible existence of cryptic or sibling species; this paper reports a study of three species of *Puto*: *P. superbus*, *P. tauricus* and *P. pilosellae*; it is determined that use of morphological characters alone is not reliable enough for discrimination between *P. superbus* and *P. tauricus* and further biological studies are required; presence of a singular circulus was regarded as characteristic of *P. pilosellae*, however, a second circulus has been found in two specimens; discussion of use of occurrence and number of circuli as a fundamental taxonomic character.
- Matile-Ferrero, D. 1996. La faune des Asterolecaniidae palmicoles de l'Amazonie péruvienne. [Palm-feeding Asterolecaniidae from Peruvian Amazonia (Homoptera: Coccoidea)]. (In French with English summary.) *Annales de la Société Entomologique de France* 32: 251-264.

- Notes: Nine Asterolecaniidae (Pit Scales) are newly reported to live on endemic palms in Peruvian Amazonia; five new species described and illustrated; *Palmaspis bolivae*, comb. nov., *P. palmae*, comb. nov., and *P. urichi*, comb. nov., are new for Peru.
- Matile-Ferrero, D. & Ben-Dov, Y. 1995. *Ripersia* Signoret: taxonomic and nomenclatural changes to settle its status (Homoptera, Coccoidea, Pseudococcidae). Bulletin de la Société Entomologique de France 100: 257-260.
- Notes: The status of the remaining fourteen species in the genus *Ripersia* is reviewed; 12 species transferred to other mealybug genera; *R. wasmanni* is synonymized with *Euripersia europaea*.
- Matile-Ferrero, D. & Etienne, J. 1996. Présence de la cochenille de l'hibiscus, *Maconellicoccus hirsutus* Saint-Martin (Hemiptera, Pseudococcidae). [Occurrence of Hibiscus Scale, *Maconellicoccus hirsutus* in St. Martin (Hemiptera, Pseudococcidae)]. (In French with English summary.) Revue Française d'Entomologie 18: 38.
- Notes: This species has recently been introduced in the Caribbean (Grenada, Trinidad, St. Kitts and Nevis); reported here for the first time in the West Indies.
- Mazzeo, G. 1995. Two new species of mealybugs (Homoptera: Coccoidea: Pseudococcidae) from Sicily. Bollettino di Zoologia Agraria e Bachicoltura. Milano Ser. II, 27:177-184.
- Notes: *Balanococcus santilongoi*, new sp. and *Rhizoecus lelloi*, new sp. collected on roots of herbaceous plants in Sicily (Mount Etna), are described.
- Mendel, Z., Assael, F., Saphir, N., Zehavi, A. & Nestel, D. 1995. The role of *Matsucoccus josephi* Bodenheimer and Harpaz (Homoptera: Matsucoccidae) and of drought in the early stages of natural regeneration after fire of Aleppo pine forest in Israel. Israel Journal of Entomology 29: 169-177.
- Notes: *M. josephi* was the dominant mortality agent, killing about 47% of the seedlings during the first four years after regeneration; about 23% of the seedling died due to drought and to interspecific and intraspecific competition; most of the mortality occurred during the first two years after regeneration; mortality due to other arthropods was practically nil; seedling density in scale-infested plots, four years after natural seeding, is high enough to ensure stands development with the second growth possibly displaying less susceptibility to *M. josephi* than the present adult trees.
- Michelakis, S. & Hamid, H.A. 1995. Integrated control methods of the citrus mealybug, *Planococcus citri* (Risso) in Crete, Greece. Israel Journal of Entomology 29: 277-284.
- Notes: This mealybug is a major pest of citrus orchards in Crete; effect of the release of *Cryptolaemus montrouzieri* was compared to the release of *Nephus reunioni*; recommendations for supplementary chemical control techniques.
- Miller, D.R. 1996. Checklist of the scale insects (Coccoidea: Homoptera) of Mexico. Proceedings of the Entomological Society of Washington 98: 68-86.
- Notes: The checklist includes 515 species-group names including 5 Aclerdidae, 11 Asterolecaniidae, 3 Cerococcidae, 63 Coccidae, 2 Conchaspidae, 4 Dactylopiidae, 224 Diaspididae, 15 Eriococcidae, 3 Halimococcidae, 4 Kermesidae, 5 Lecanodiaspididae, 20 Margarodidae, 16 Ortheziidae, 132 Pseudococcidae and 8 Tachardiidae.
- Miller, R.H., Dunley, J.E. & Hill, W.B. 1996. IPM in pears: the grape mealybug problem. Good Fruit Grower 47: 35-37.

Notes: Discussion of biology, chemical and biological control, and current research on the biological control and sampling of *Pseudococcus maritimus*, a serious pest of apples and pears in north central Washington state.

Miller, D.R. & Gimpel, M.E. 1996. Nomenclatural changes in the Eriococcidae (Homoptera: Coccoidea). Proceedings of the Entomological Society of Washington 98: 597-606.

Notes: Nomenclatural changes for catalog and database of the family Eriococcidae.

Miller, D.R. & Watson, G.W. 1995. Douglas J. Williams, the modern guru of coccidology. Israel Journal of Entomology 29: 1-4.

Notes: Review of the life and work of this exemplary entomologist to honor him as part of ISSIS-VII at Bet Dagan, Israel, on the occasion of his 70th birthday.

Miller, D.R. & Williams, D.J. 1995. A revision of the genus *Micrococcus* Leonardi with an analysis of its family placement (Abstract only). Israel Journal of Entomology 29: 99.

Notes: Although *Micrococcus* has been regarded as a member Eriococcus, reasons are given for why its placement is problematic.

Miller, D.R. & Williams, D.J. 1995(1993)a. Systematic revision of the Family Micrococcidae (Homoptera: Coccoidea), with a discussion of its relationships, and a description of a gynandromorph. Bollettino del Laboratorio di Entomologia Agraria 'Filippo Silvestri'. Portici 50:199-247.

Notes: Eight species and two genera reviewed; keys, illustrations and descriptions of first instars, second instar females, third instar females and adult males; this family most closely related to the Aclerdidae.

Mishra, Y.D., Bhattacharya, A. & Naqvi, A.H. 1996. Effect of plant differences in the initial mortality of lac insect *Kerria lacca* Kerr. Indian Forester 122: 189-190.

Notes: *K. lacca* thrives on a number of host plants but almost always with a mortality of 75-90%; investigation of heritability is advised.

Miyanoshita, A. & Tatsuki, S. 1995. Host-associated differences in *Aspidiotus cryptomeriae* Kuwana (Homoptera: Coccoidea: Diaspididae). (In Japanese with English summary.) Japanese Journal of Applied Entomology and Zoology 39: 159-162.

Notes: Previous work showed that *Cryptomeria japonica* feeders and *Torreya nucifera*, feeders of *Aspidiotus cryptomeriae* are separate host races due to distinct morphological characters and virtually monophagous feeding habits; in this experiment, two populations of *A. cryptomeriae* were reared under the same conditions except for the host plant; there were no significant differences between them for five morphological characters except for pygidium length; results generally indicate that the *T. nucifera* feeding race has very stable morphology that is not affected by the host plant.

Mohammad, Z.K., Ezzat, Y.M. & Aly, A.G. 1995. Recent review of Egyptian little known species of Coccoidea (Homoptera). Journal of the Egyptian German Society of Zoology 16: 477-533.

Murdoch, W.W., Swarbrick, S.L., Luck, R.F., Walde, S. & Yu, D.S. 1996. Refuge dynamics and metapopulation dynamics: an experimental test. American Naturalist 147: 424-444.

Notes: *Aonidiella aurantii* is controlled by the parasitoid *Aphytis melinus* in many areas, and in a study area in California the interaction appeared dynamically stable; results indicate that stability in the control population was not maintained by either refuge or metapopulation dynamics; reduced pest recruitment and density in the exterior of trees

lacking a refuge population were associated with increased (i.e. density-dependent) pest survival that did not reflect a change in parasitism.

Myartseva, S.N., Kalagina, G.A. & Potaeva, A.G. 1995. Graminicolous scale insects of Turkmenistan. *Israel Journal of Entomology* 29: 223-225.

Notes: 30 species belonging to 6 families of scale insects (Pseudococcidae, Eriococcidae, Coccidae, Diaspididae, Margarodidae and Aclerdidae) have been recorded in Turkmenistan from 23 genera of gramineous plants, family Poaceae; most frequently infested host plants include *Phragmites australis*, *Erianthus purpurascens*, *Sorghum*, *Stipa*, *Festuca* and *Agropyron*; 42 species of parasitic Hymenoptera, family Encyrtidae, were reared from 14 species of the above.

Neethling, C. & Lange, H.C. de 1995. Susceptibility of three passion fruit types to the white peach scale. *Fruits* 50: 305-309.

Notes: *Passiflora caerulea* was least susceptible to *Pseudaulacaspis pentagona*.

Nestel, D., Pinhassi, N., Reuveny, H., Oppenheim, D. & Rosen, D. 1995. Development of a predictive phenological model for the spring generation fo the olive scale, *Parlatoria oleae* (Colvée), in Israel: preliminary results. *Israel Journal of Entomology* 29: 227-235.

Notes: Investigation of the onset and rate of oviposition and egg-hatching in the spring generation of this olive scale; the model developed was shown to accurately predict the timing of the phenological events, with a maximum deviation of 5 days from the predicted dates; it is suggested that this model can be successfully applied to optimize pesticidal treatments against olive scale crawlers.

Ohe, W.v.d., Mautz, D., Bosch, U. & Ohe, K.v.d. 1995. Chemical characteristics of Coccidae honeys. (In German with English summary.) *Apidologie* 26: 312-313.

Notes: Summary also in French; honeydew flow of *Physokermes hemicryphus* and *P. piceae* was investigated in southeast Germany over two years; chemical, physical (dry matter, electrical conductivity, enzyme activity, formic and citric acid, saccharide spectra) and microscopical analyses were carried out on honeydew, crop content and honey.

Ordogh, G. 1995. Morphology of nymphs and biology of *Rhodococcus perornatus* (Cockerell and Parrott) (Homoptera: Coccidae) in Hungary. *Israel Journal of Entomology* 29: 93-96.

Notes: *R. perornatus* was formerly known as a rare, steppe-inhabiting, mesophilous species in the Palaeractic region; however, in recent years it is becoming a pest of cultivated roses in Hungary, mainly in the Budapest region; biology; description and illustration of nymphs.

Paloukis, S.S. & Navrozidis, E.I. 1995. Effectiveness of a new insecticide (Diofenolan) for control of San José scale, *Quadraspidiotus perniciosus* (Comstock) (Diaspididae), on peach trees in northern Greece. *Israel Journal of Entomology* 29: 285-286.

Notes: Methidathion was used as a control; mortality as a result of Diofenolan was about 95% and reduced parasitization by the endoparasite *Encarsia perniciosi* only slightly, whereas Methidathion reduced it by more than 95%.

Panis, A., Oi, E. & Pinet, C. 1995. Walking and non-reproductive behaviour in two species of *Encarsia* (Hymenoptera: Aphelinidae) used in studies on biological control of the white peach scale (Homoptera: Diaspididae). *Israel Journal of Entomology* 29: 321-326.

Notes: The parasitoids *Encarsia berlesei* and *E. diaspidicola* are minute insects with a closely similar morphology; identification of live parasitoids is needed for studies on biological control of *Pseudaulacaspis pentagona*; the non-reproductive behaviour of both parasitoids

was studied and described on peach trees and in the laboratory for the first time; walking pace is a good diagnostic character for use with the naked eye; workers not accustomed to observing live parasitoids can identify them at their habitat, by using a hand lens.

Pedata, P.A., Hunter, M.S., Godfray, H.C.J & Viggiani, G. 1995. The population dynamics of the white peach scale and its parasitoids in a mulberry orchard in Campania, Italy. *Bulletin of Entomological Research* 85: 531-539.

Notes: *Pseudaulacaspis pentagona* was a serious pest of mulberry until a successful biological control program in Italy at turn of century; since 1950s it has returned as a sporadic pest of commercial peach and, more recently, kiwi fruit orchards; survey of parasitoids in an unmanaged mulberry orchard revealed *Aphytis proclia* to be the most abundant, followed by *Encarsia berlesei* and *Pteroptrix orientalis*.

Peleg, B.A. & Bar-Zakay, I. 1995. The pest status of citrus scale insects in Israel (1984-1994). *Israel Journal of Entomology* 29: 261-264.

Notes: Review of *Aonidiella aurantii*, *Ceroplastes floridensis*, *Planococcus citri*, *Pseudococcus cryptus* and *Icerya purchasi*; extent of damage they cause; effectiveness of chemical and other controls.

Pellizzari-Scaltriti, G. 1995. A new species of *Paralecanopsis* (Homoptera Coccoidea Coccidae) from Italy. *Bollettino di Zoologia Agraria e Bachicoltura*. Milano Ser. II, 27: 35-44.

Notes: Description and illustration of adult female and crawler; key to species of *Paralecanopsis*; comparisons; biological notes; recorded on *Ammophila littoralis*.

Pijls, J.W.A.M., Hofker, K.D., Van Staalduinen, M.J. & Van Alphen, J.J.M. 1995. Interspecific host discrimination and competition in *Apoanagyrus* (*Epidinocarsis*) *lopezi* and *A. (E.) diversicornis*, parasitoids of the cassava mealybug *Phenacoccus*. *Ecological Entomology* 20: 326-332.

Notes: Results indicated that *A. lopezi* accepted both host types (parasitized and unparasitized) equally for oviposition, whereas *A. diversicornis* accepted fewer hosts that had been parasitized by *A. lopezi* than unparasitized ones; oviposition intervals and hatching times measured; *A. lopezi* gains more than *A. diversicornis* because of its superior within-host competitive abilities; low survival probability of *A. diversicornis* may partly explain its failure to establish when introduced into Africa as part of a biological programme of *P. manihoti*.

Pijls, J.W.A.M., Poleij, L.M., Van Alphen, J.J.M. & Meelis, E. 1996. Interspecific interference between *Apoanagyrus lopezi* and *A. diversicornis*, parasitoids of the cassava mealybug *Phenacoccus manihoti*. *Entomologia Experimentalis et Applicata* 78: 221-230.

Notes: This is the first experiment that shows that *A. diversicornis* has an advantage over *A. lopezi*; under certain conditions *A. diversicornis* produced offspring at a rate three times that of *A. lopezi*.

Pijls, J.W.A.M. & van Alphen, J.J.M. 1996. On the coexistence of the cassava mealybug parasitoids *Apoanagyrus diversicornis* and *A. lopezi* (Hymenoptera: Encyrtidae) in their native South America. *Bulletin of Entomological Research* 86: 51-59.

Notes: The encyrtid parasitoid *A. diversicornis* failed to establish itself in Africa where it was introduced, in addition to *A. lopezi* for biological control of the cassava mealybug, *Phenacoccus manihoti*; *A. lopezi* is a better competitor and it was assumed that it prevents their coexistence; however, they successfully coexist in their native South America; this

experiment demonstrates that the availability of *Phenacoccus herreni* as an alternate host for *A. diversicornis* enhances coexistence of these parasitoids.

Pijls, J.W.A.M., Van Steenbergen, H.J. & Van Alphen, J.J.M. 1996. Asexuality cured: the relations and differences between sexual and asexual *Apoanagyrus diversicornis*. *Heredity* 76: 506-513.

Notes: Investigation of whether asexual (thelytokous) *Apoanagyrus diversicornis* and sexual (arrhenotokous) *A. diversicornis* (Hymenoptera: Encyrtidae) belong to the same biological species; the strains are allopatric and there are no morphological differences; history and origin of the strains; differences do exist in survival probability from egg to adult and also in female behavior; asexuality is shown to be caused by microorganisms, is "curable", and both strains belong to same biological species.

Pinhassi, N., Nestel, D. & Rosen, D. 1996. Oviposition and emergence of olive scale (Homoptera: Diaspididae) crawlers: regional degree-day forecasting model. *Environmental Entomology* 25: 1-6.

Notes: Investigation of the temperature-driven onset and rate of oviposition and egg hatch of the spring generation of the olive scale, *Parlatoria oleae* in northern Israel; phenology was studied at different elevations and on two different host species (*Malus silvestris* and *Pyrus communis*; the model accurately predicted the onset of egg hatch.

Podsiadlo, E. 1995. Interrelations of *Quadraspidiotus zonatus* (Frauenfeld) and its encyrtid parasite of the genus *Metaphycus* Mercet. *Israel Journal of Entomology* 29: 237-238.

Notes: Preliminary observations on the life cycle of this species and its parasite were made in Poland, and revealed that *Q. zonatus* was univoltine, while *Metaphycus* sp. was bivoltine in the given climatic conditions.

Polavarapu, S. & Polk, D.F. 1995. Insecticide evaluations against foliar and fruit feeding insects on blueberries, 1994. Pp. 49-50. in: Burditt, A.K., Jr. (Ed.) *Arthropod management tests*. Vol. 20. Entomological Society of America, Lanham, MD.

Notes: Eight insecticides tested against no treatment as a control.

Porcelli, F. 1995. Antennal sensilla of male Diaspididae (Homoptera): comparative morphology and functional interpretation. *Israel Journal of Entomology* 29: 25-45.

Notes: The structure and ultrastructure of the antenna in males of several Diaspididae species was studied using light microscopy, and scanning and transmission electron microscopy; several types of sensilla are described; following comparative observations it is hypothesized that the general organization of the sensilla is common to Diaspididae.

Prinsloo, G.L. 1995. Revision of the southern African species of *Coccobius* Ratzeburg (Hymenoptera: Aphelinidae), parasitoids of armoured scale insects (Homoptera: Diaspididae). *Journal of Natural History* 29: 1517-1541.

Notes: Hosts for these parasitoid species include *Pudaspis newsteadi* on *Acacia* sp., *Aulacaspis maduinensis*, *Tachardina africana* on *Acacia* sp., *Saissetia somereni* and *Parasaissetia nigra* on *Syzygium* sp., *Entaspidiotus lounsburyi* and *Aonidia mesembryanthemi* on *Carpobrotus*, *Ceroplastes* sp. on *Aspalathus* sp. and *Chrysocoma tenuifolia*, *Pudaspis newsteadi* on *Acacia karroo*, *Clavaspis pectinata* on *Pyrus communis*, *Ceroplastes destructor* on *Melia azedarach*, *Africaspis chionaspiformis*, *Melanaspis corticosa*, and *Rolaspis lounsburyi* on *Sideroxylon inerme*.

Priore, R., Tremblay, A., Tartaglia, A. & Bianco, M. 1996. [Chemical control trials against *Marchalina hellenica* (Gennadius) (Coccoidea Margarodidae).] Prove di lotta contro *Marchalina hellenica* (Gennadius) (Coccoidea Margarodidae). (In Italian with English summary.) ATTI Giornate Fitopatologiche 1: 169-172.

Notes: This Greek pine scale is restricted to the Island of Ischia (Naples Gulf); effectiveness of the injection method is confirmed.

Qin, T.K. & Gullan, P.J. 1995. A cladistic analysis of wax scales. Systematic Entomology 20: 289-308.

Notes: The analysis of all genera previously believed to be separate, i.e., *Ceroplastes*, *Ceroplastidia*, *Cerostegia*, *Gascardia*, *Paracerostegia*, and *Waxiella* are all considered to belong in the genus *Ceroplastes*.

Ragab, M.E. 1995. Adaptation of *Rodolia cardinalis* (Mulsant) (Col., Coccinellidae) to *Icerya aegyptiaca* (Douglas) (Hom., Margarodidae) as compared with *Icerya purchasi*. Journal of Applied Entomology 119: 621-623.

Notes: Results indicate that *R. cardinalis* is well adapted to *I. aegyptiaca* in Egypt.

Ragab, M.E. 1995a. Efficiency of *Scutellista cyanea* Motsch. (Hym., Pteromalidae) and *Tetrastichus ceroplastae* (Gir.) (Hym., Eulophidae) in population suppression of *Ceroplastes rusci* L. (Hom., Coccidae). Journal of Applied Entomology 119: 627-630.

Notes: Study of the relationship between the population fluctuations of the wax scale, *C. rusci*, and its parasites on quince trees; results assured the important role of these parasites as biotic mortality factors against the populations of *C. rusci* in Egypt.

Ragusa, S. & Tsolakis, H. 1995. The effect of *Phenacoccus madeirensis* Green (Coccoidea: Pseudococcidae) on some biological parameters of four species of phytoseiid mites (Parasitiformes: Phytoseiidae). Israel Journal of Entomology 29: 301-307.

Notes: This mealybug was supplied as prey to the following species of phytoseiid mites: *Euseius stipulatus*, *Iphiseius degenerans*, *Typhlodromus exilaratus* and *Typhlodromus cryptus* in order to assay its effect on their postembryonic development and oviposition rate; no young stages of the four species developed beyond the protonymph stage; only very few eggs were laid by females of the four species.

Ripka, G., Reiderné S., K. & Kozár, F. 1996. Recent data to the Coccid and Aleyrodid fauna (Homoptera: Coccoidea, Aleyrodoidea) on woody ornamentals in the Budapest area. (In Hungarian with English summary.) Növényvédelem 32: 7-17.

Notes: This survey found that coccids occurred on 154 woody species from Pseudococcidae (4), Eriococcidae (2), Cryptococcidae (1), Coccidae (8), Asterolecaniidae (2) and Diaspididae (17); highest densities occurred among *Pseudaulacaspis pentagona*, *Unaspis euonymi*, *Epidiaspis leperii* and *Chionaspis salicis*; *P. pentagona* occurred on the most plant species (69); *Parthenolecanium corni* was found on 45, *Epidiaspis leperii* on 29, *Phenacoccus aceris* on 16 and *Lepidosaphes ulmi* on 12 plant species; natural enemies mentioned.

Rose, M. & Saudffer, S. 1995. Biological control of scale insects in interior plantscapes (Abstract only). Israel Journal of Entomology 29: 287.

Notes: Scale insects comprise more than half of the pest species encountered thus far in US botanical gardens, commercial plantscapes, conservatories, zoological gardens and ecosystem representations; development of biological control programs for key pest species

was discussed from the aspects of systematics, natural enemies, efficacy evaluations, methodologies, and interaction between horticulturists, insectaries and researchers.

Rosenheim, J.A. & Hongkham, D. 1996. Clutch size in an obligately siblicidal parasitoid wasp. *Animal Behaviour* 51: 841-852.

Notes: Clutch size investigated in the solitary parasitoid *Comperiella bifasciata*, which attacks the citrus pest *Aonidiella aurantii*, and commonly produces multiple-egg clutches; one factor involved in clutch size is proximity of high quality hosts.

Rossmann, A.Y. & Miller, D.R. 1996. Systematics solves problems in agriculture and forestry. *Annals of the Missouri Botanical Garden* 83: 17-28.

Notes: This paper presents examples in which systematics has contributed to solving problems in agriculture and forestry; successful efforts to discover and develop biological agents that control agricultural pests and pathogens depend on systematics; international exchange of agricultural commodities can be enhanced or hindered by accurate or inaccurate systematic knowledge, as exemplified by the recently opened market for California wheat in the People's Republic of China; systematics is essential in directing the collection, organization and use of vascular plant germplasm for breeding improved crops; systematic knowledge also helps to prevent introductions of exotic pests and pathogens such as those that have devastated forests in eastern North America.

Rubin, A. 1995. A decade of integrated control of persimmon pests in Israel (Abstract only). *Israel Journal of Entomology* 29: 287.

Notes: Major pests of persimmon, *Diospyros kaki* in Israel are the citrus mealybug, *Planococcus citri* and the Mediterranean fruitfly, *Ceratitidis capitata*; minor pests include *Cryptoblabes gnidiella*, *Retithrips syriacus* and the Florida wax scale, *Ceroplastes floridensis*; encyrtids released for this experiment are *Leptomastidea abnormis* and *Anagyrus pseudococci*; predators are *Cryptolaemus montrouzieri*, *Nephus reunioni* and *Symphaerobius sanctus*.

Ruiz-Cancino, E. & Coronado-Blanco, J.M. 1995. The citrus snow scale, *Unaspis citri* (Comstock) (Diaspididae) in Tamaulipas, Mexico (Abstract only). *Israel Journal of Entomology* 29: 266.

Notes: This citrus snow scale can cause severe damage on citrus; spreads very slowly and is not yet distributed widely in this region; this research investigates the extent, locations, infestation rates, and associated parasitoids.

Russo, A. 1995. Arthropoda of Lampedusa, Linosa and Pantelleria (Sicily Channel, Mediterranean Sea). *Arthropoda di Lampedusa, Linosa e Pantelleria (Canale di Sicilia, Mar Mediterraneo)*. (In Italian with English summary.) *Naturalista Sicilia* 19: 341-350.

Notes: Lists 2 margarodids, 3 mealybugs, 1 putoid, 1 eriococcid, 2 pit scales, 4 soft scales, and 7 armored scales from the Island of Pantelleria.

Santos, A.C. & Gravena, S. 1995. [Control of the Rufous Scale *Selenaspidus articulatus* Morgan (Homoptera: Diaspididae) with mineral oil and dimethoate.] Controle da cochonilha pardinha *Selenaspidus articulatus* Morgan (Homoptera: Diaspididae) com óleo mineral e dimetoato. (In Portuguese with English summary.) *Anais da Sociedade Entomologica do Brasil* 24: 411-414.

Notes: This chemical control plan was demonstrated to be a good alternative for managing Rufous Scale on citrus.

Savopoulou-Soultani, M. 1996. Seasonal development and distribution of *Unaspis euonymi* (Comstock) on *Euonymus japonica* L. shrubs. *Anzeiger Schädlingkunde, Pflanzen(schutz) und Umweltschutz* 69: 103-105.

Notes: Branches collected and development observed in the lab; timing of first eggs, peak crawler density and male/female ratio on leaves vs. stems.

Saxena, R. 1995. Effects on viruses and organisms: Insecta, insects: Effects by order of Insecta: Insects: Homoptera: Leaf- and planthoppers, aphids, psyllids, whiteflies and scale insects. Pp. 268-286. *in*: Schmutterer, H. (Ed.). *The Neem Tree: Azadirachta indica* A. Juss and other Meliaceous plants. VCH Publishers, Inc., Weinheim, Germany; New York.

Notes: Subtitle of book: Source of unique natural products for integrated pest management, medicine, industry and other purposes. Effects of neem studied on scale species such as *Aonidiella aurantii*, *A. citrina*, *Planococcus citri*, *A. orientalis* and *Pinnaspis strachani*; survival; reproduction; mating behavior; oviposition and egg-hatchability.

Schaub, L.P., Mani, E., Bloesch, B. & Schwaller 1995. Distribution of *Quadraspitiotus perniciosus* (San Jose scale) in Switzerland based on interpolated pheromone trap data. *Bulletin OEPP* 25: 631-636.

Notes: Geographic information system used to create a surface representation of 1990 pheromone-trap catch data of *Q. perniciosus*; the major tree-fruit production regions of Switzerland are at risk but still free from this scale.

Schiller, G. & Mendel, Z. 1995. Is the overlap of ranges of Aleppo pine and Brutia pine in the east Mediterranean natural or due to human activity? *Population Genetics and Genetic Conservation of Forest Trees*. 159-163.

Notes: Papers presented at an international symposium organized by IUFRO, held 24-28 August 1992 at Carcans-Maubuisson, France; a synthesis of genetic and entomological studies support the assumption that the several island-like occurrences of *Pinus halepensis* in southern Turkey, and of *Pinus brutia* subsp. *brutia* in Chalkidiki, mainland Greece, and on the island of Thasos, are the result of human activity and not relics of a former larger area of distribution; evidence presented to support this hypothesis includes the presence of, and damage caused by, the pine bast scale (*Matsucoccus josephi*) on *P. halepensis* provenances, and the occurrence of *Marchalina hellenica* (used since ancient times, to increase honey production through provision of honeydew forage) on *P. brutia*.

Sclar, D.C. & Cranshaw, W. 1995. Control of mature twocirculi mealybug with insecticide applications, 1994. *Arthropod management tests*. 312-313.

Notes: Five chemicals tested against a water spray control.

Sclar, D.C. & Cranshaw, W.S. 1996. Evaluation of new systemic insecticides for elm insect pest control. *Journal of Environmental Horticulture* 14: 22-26.

Notes: Advantage of using systemic insecticides that can be injected either into the root system or trunk of woody plants is control of drift; *Ulmus americana* and *U. pumila* were injected with imidacloprid and abamectin against *Gossyparia spuria* and *Tinocallis ulmifolii*.

Sengonca, C. & Faber, T. 1996. Studies on developmental stages of the horse chestnut scale insect, *Pulvinaria regalis* Canard (Hom., Coccidae), in the open land and in the laboratory. *Anzeiger Schädlingkunde, Pflanzen(schutz) und Umweltschutz* 69: 59-63.

Notes: This scale studied on *Aesculus x carnea* in the urban area of Bonn; scale growth also determined on sycamore maple (*Acer pseudoplatanus*) and *Aesculus hippocastanum* at different temperatures in the lab; different developmental stages were separated by setting up a frequency distribution of the anal plate length and by simultaneous measuring of new and old anal plate during molting.

Sinacori, A. 1995. Bio-ethological observations on *Phenacoccus madeirensis* Green (Coccoidea: Pseudococcidae) in Sicily. Israel Journal of Entomology 29: 179-182.

Notes: This species recorded for the first time in western Sicily in 1991; preferred hosts are *Erythrina viarum* and *Acanthus mollis*, but it has been recorded on 40 other host plants; biological notes.

Sklarzewicz, T. & Bilinski, S.M. 1995. Structure of ovaries in ensign scale insects, the most primitive representatives of Coccomorpha (Insecta, Hemiptera). Journal of Morphology 224: 23-29.

Notes: The ovaries of *Orthezia urticae* and *Newsteadia floccosa* are paired and composed of numerous short ovarioles; detailed description of ovarioles; total number of germ cells per ovariole (i.e. cluster) is variable, but is always between 32 and 64, suggesting five successive mitotic cycles of a cystoblast; additional divisions of individual cells are likely responsible for the generation of the cluster; anagenesis of hemipteran ovarioles is discussed in relation to the findings presented.

Smith, D. 1995. Effect of the insect growth regulator buprofezin against citrus pests *Coccus viridis* (Green), *Polyphagotarsonemus latus* (Banks) and *Aonidiella aurantii* (Maskell) and the predatory coccinellid *Chilocorus circumdatus* Gyllenhal. Plant Protection Quarterly 10: 112-115.

Notes: Trails of buprofezin testing the potency against these scale pests and its toxicity against their natural enemies; discussion of possible role and use of buprofezin in integrated pest management in Queensland citrus.

Smith, D., Papacek, D. & Smith N. 1995. Biological control of citrus snow scale, *Unaspis citri* (Comstock) (Homoptera: Diaspididae) in south-east Queensland, Australia. Israel Journal of Entomology 29: 253-260.

Notes: This scale species has been a major pest of citrus in eastern Australia, only partly under biological control and difficult to control with pesticides; five parasitoid species have been previously introduced (all southeast in origin) but none successfully controlled this species; this project attempted to establish *Chilocorus circumdatus* for control with good success within two years.

Stimmel, J.F. 1995a. "Japanese Maple Scale," *Lopholeucaspis japonica* (Cockerell). Regulatory Horticulture (Pa. Dept. of Agric.) 21: 33-34.

Notes: This species was introduced from Japan into San Francisco in 1896; hosts; distribution; identification; life history; description of damage; control techniques.

Stimmel, J.F. 1996. Spruce bud scale, *Physokermes hemicryphus* (Dalman) (Homoptera: Coccidae). Regulatory Horticulture (Pa. Dept. of Agric.) 22: 9-11.

Notes: This European introduction into the U.S. has spread throughout the northeast, the upper midwest (Wisconsin), and the northwest; identification; life history; description of damage; control measures.

Stimmel, J.F. 1996. Miscanthus mealybug, *Miscanthicoccus miscanthi* (Takahashi). Regulatory Horticulture (Pa. Dept. of Agric.) 22: 21-23.

Notes: This introduced mealybug attacks ornamental grasses, which are increasingly popular in landscape plantings; hosts and distribution; field description; life history; description of damage; control recommendations.

Sugonyaev, E. 1995. Some peculiarities of host specificity of coccid-inhabiting chalcidoid parasitoids (Hymenoptera) (Abstract only). Israel Journal of Entomology 29: 331.

Notes: Preference of certain host taxa is typical for parasitoid species of most genera of the families Encyrtidae and Aphelinidae; examples given of parasitoids that prefer Coccidae; discussion of characteristics that play a preadaptive role and determine the background for formation of aberrant trophic relations.

Suresh, S. & Mohanasundaram, M. 1996. Coccoid (Coccoidea: Homoptera) fauna of Tamil Nadu, India. Journal of Entomological Research. New Delhi 20: 233-274.

Notes: Among a total of 95 species under 12 families, 10 species of coccids belonging to the Genera *Pulvinaria*, *Aspidiotus*, *Aulacaspis*, *Chionaspis*, *Morganella*, *Parlatoria*, *Anomalococcus*, *Criniticoccus*, *Maconellcoccus* and *Pseudococcus* were new to science; species recorded for the first time in India are *Aulacaspis martini*, *Chionaspis broughae*, *Morganella cueroensis*, *Ferrisia consobrina*, *Parlatoria citri* and *Aspidiotus cochereau*; hosts.

Takagi, S. 1995. A new species of *Beeson* with larval polymorphism, inducing a stem gall on *Shorea curtisii* in Singapore [Homoptera: Coccoidea: Beesoniidae]. Insecta Matsumurana 52: 1-19.

Notes: Description on the basis of larval forms purported to belong to four ontogenetic courses; larval polymorphism is believed to be associated with exploitation of more than a single feeding site provided by the gall's structure; the five known species of the Beesoniidae induce galls on dipterocarps or oaks -- an unexpected combination of host plants from the viewpoint of plant phylogeny.

Takagi, S. 1995a. An approach to the Rugaspidiotini-problem [Homoptera: Coccoidea: Diaspididae]. Insecta Matsumurana 52: 21-79.

Notes: Five genera and six species of armoured scale insects were examined in connection with a pending problem concerning the composition of the tribe Rugaspidiotini; emphasis on characters of the first instar; the results strengthen a previous supposition that the tribe is an assemblage of unrelated genera; *Nimbaspis molardi* and *Natalaspis* are revised; *Anaimalaia scabra*, new sp., new gen, is described from South India as occurring on *Pterospermum* and *Amphisoma erectum*; *Galeomytilus obesus*, new gen., new sp. is described from Palawan Is., the Philippines, on *Colona*.

Tang, F.T. 1995. What are the correct taxonomic characters of the type species of *Matsucoccus* (Margarodidae)? (Abstract only). Israel Journal of Entomology 29: 99.

Notes: Discussion of reinterpretation of the characters of *Xylococcus matsumurae*, type species for this genus.

Tanne, E. 1995. Mealybugs as vectors of plant viruses (Abstract only). Israel Journal of Entomology 29: 183.

Notes: 18 species of mealybugs (Pseudococcidae), belonging to ten genera, have been reported to be vectors of plant viruses since the 1950s; viruses mentioned include tobacco

mosaic virus (TMV), cacao viruses (especially cacao swollen shoot virus (CSSV)) by *Planococcoides njalensis*, Dasheen mosaic virus in the South West Pacific, grapevine leafroll disease and grapevine corky-bark disease by *Pseudococcus longispinus*, *Planococcus ficus* and *P. citri*, and grapevine virus A (GVA) by *P. longispinus*.

Uygun, N., Karaca, I., Sekeroglu, E. 1995. Population dynamics of *Aonidiella aurantii* (Maskell) (Homoptera: Diaspididae) and its natural enemies on citrus in the Mediterranean region of Turkey from 1976 to 1993. *Israel Journal of Entomology* 29: 239-246.

Notes: This California red scale (CRS) is a harmful pest of citrus orchards in the East Mediterranean region of Turkey; long-term population changes of CRS and its natural enemies were studied in an orchard where Integrated Pest Management (IPM) programs are in effect.

Varshney, R.K. 1995. Genera of the Diaspidid scale insects (Coccoid: Diaspidoidea) of South Asia. *Israel Journal of Entomology* 29: 153-155.

Notes: The Diaspidoid scale insects of South Asia belong to 112 genera in the Halimococcidae (1 genus) and the Diaspididae (116 genera); checklist provided; a total of 362 species in inventory.

Veenakumari, K. & Mohanraj, P. 1996. Folivorous insects damaging teak, *Tectona grandis* L. (Verbenaceae) in the Andaman Islands, Bay of Bengal, Indian Ocean. *Journal of Entomological Research*. New Delhi 20: 177-178.

Notes: *Icerya seychellarum* is one of the pest insects mentioned.

Viggiani, G. & Loia, M. 1995. Phenology of *Kuwanina rubra* Goux (Margarodidae) and its parasitoid *Mayrencyrtus merceti* Hoffer (Hymenoptera: Encyrtidae) in southern Italy (Abstract only). *Israel Journal of Entomology* 29: 266.

Notes: Biological notes on both the scale species and its parasitoid.

Wakman, W., Teakle, D.S., Thomas, J.E. & Dietzgen, R.G. 1995. Presence of clostero-like virus and a bacilliform virus in pineapple plants in Australia. *Australian Journal of Agricultural Research* 46: 947-958.

Notes: It is known that wilt follows feeding of the mealybugs, *Dysmicoccus brevipes*, *D. neobrevipes* and *Pseudococcus longispinus* on pineapple (but not on *Agave*; *Pseudococcus longispinus* is also known to transmit the clostrovirus, grapevine virus A; investigation of substances believed to be involved, and suggestions for future research.

Walker, G.P. & Aitken, D.C.G. 1996. Non-target effect of sprays to control California red scale (*Aonidiella aurantii* Maskell), Hom., Diaspididae) on citrus red mite (*Panonychus citri* (McGregor), Acari, Tetranychidae). *Journal of Applied Entomology* 120: 175-180.

Notes: Five insecticides used to control the diaspidid *A. aurantii* were evaluated in orange and lemon plots in California.

Walker, G.P., Morse, J.G. & Arpaia, M.L. 1996. Evaluation of a high-pressure washer for postharvest removal of California red scale (Homoptera: Diaspididae). *Journal of Economic Entomology* 89: 148-155.

Notes: The high-pressure water sprays physically dislodges red scale from naval oranges; different pressures and different durations of treatment were compared; primary economic damage is cosmetic.

Williams, D.J. 1996. A synoptic account of the mealybug genus *Ferrisia* *Entomologist's Monthly Magazine* 132: 1-10.

- Notes: Eleven species currently assigned to this genus; key to eight adult females; *F. kandyensis* is transferred to *Chorizococcus*, *F. quaintancii* is known from third instars only, and *F. neovirgata* was possibly described from third instars; *Heliococcus malvastrus*, previously synonymised as *Ferrisia virgata* is restored to species rank as *F. malvastra*; *Ferrisia consobrina* is synonymised with it.
- Williams, D.J. 1996a. Four related species of root mealybugs of the genus *Rhizoecus* from east and southeast Asia of importance at quarantine inspection (Hemiptera: Coccoidea: Pseudococcidae). *Journal of Natural History* 30: 1391-1403
- Notes: Discussion of *Rhizoecus carolinensis*, *R. hibisci*, *R. bacorum*, new sp., and *R. saintpauliae*; key provided.
- Williams, D.J. 1996b. A brief account of the hibiscus mealybug *Maconellicoccus hirsutus* (Hemiptera: Pseudococcidae), a pest of agriculture and horticulture, with descriptions of two related species from southern Asia. *Bulletin of Entomological Research* 86: 617-628.
- Notes: A brief account is given of damage of *Maconellicoccus hirsutus* and a redescription. Redescribes *M. multipori* (Takahashi) and a new species *M. ramchensis* from Nepal.
- Williams, D.J. & Brookes, H.M. 1995. A review of the scale insect subtribe Andaspidina (Hemiptera: Coccoidea: Diaspididae) and a new genus, *Notandaspis*, for two Australian species. *Transactions of the Royal Society of South Australia* 119: 183-189.
- Notes: The subtribe Andaspidina is recognised as one of three subtribes of the scale insect tribe Lepidosaphini; literature review; diagnostic keys provided for subtribes and genera of the subtribe Andaspidina; *Notandaspis*, new genus, is described for *Mytilaspis* (*Coccomytilus*) *hymenantherae* Green, a species described originally from Victoria and presently included in *Andaspis* and for a new species *Notandaspis oodnadattae*, new species form South Australia.
- Williams, M.L. & MacVean, C.M. 1995. Ethnococcidology: use of the giant margarodids, *Llaveia* spp. (Homoptera: Coccoidea: Margarodidae), by indigenous peoples of Mesoamerica in their culture, medicine and arts. *Israel Journal of Entomology* 29: 147-148.
- Notes: History and description of extraction process for the product used as a finish and preservative on folk art decorative wooden and gourd objects;
- Wysoki, M., Yossi, I. & Rosen, D. 1995. The oriental red scale, *Aonidiella orientalis* (Newstead) (Diaspididae): biology, phenology, geographic distribution and natural enemies in Israel (Abstract only). *Israel Journal of Entomology* 29: 267.
- Notes: Relatively new pest in Israel; first recorded on mango in 1980 in the Arava Valley; now occurs north and is established throughout mango-growing regions of Israel and also occurs on olive, guava, feijoa, and acacia; description of damage; natural enemies include parasitoids *Comperiella bifasciata*, *Habrolepis aspidioti*, *Aphytis melinus*, *A. lingnanensis* and *Encarsia* sp., hyperparasitoids *Marietta javensis*, *Ablerus guadrii*, and *Zaomma* n. sp. near *Carinae*, predators *Stethorus gilvifrons*, *Chilocorus bipustulatus* and *Chrysoperla carnea*, and parasitic mite *Hemisarcophaga coccophagus*.
- Xie, Y., Liu, X., Li, J. & Tang, M. 1995. The effect of urban air pollution on populations of *Eulecanium gigantea* (Shinji) (Coccidae) in Taiyuan City, China. *Israel Journal of Entomology* 29: 165-168.

Notes: The scale insect population on its host plant *Sophora japonica* is positively correlated with the number of cars driving in a specific district and can be used for monitoring air pollution in city streets.

Yardeni, A. & Shapira, E. 1995. Thinning populations of the Florida wax scale, *Ceroplastes floridensis* Comstock (Coccidae), by use of potassium nitrate and spray oil, as an option in IPM of citrus groves in Israel. Israel Journal of Entomology 29: 271-276.

Notes: This major pest of citrus is usually controlled by non-selective insecticides; it has an advantage over its natural enemies in the build-up of its population in a "clean" grove, following pesticidal control, due to the ability of its wind-dispersed crawlers to invade the grove and the tremendous rate of increase of its population; thinning the population by a nutritional spray with soil might be an additional option in IPM.

Yasnosh, V.A. 1995. Coccids of economic importance and their control in the republic of Georgia. Israel Journal of Entomology 29: 247-251.

Notes: The most harmful or heaviest infestations of the 18 coccid species recorded in citrus groves are: *Lopholeucaspis japonica*, *Chysomphalus dictyospermi*, *Ceroplastes japonicus*, *C. sinensis*, *Aonidiella citrina*, *Chloropulvinaria aurantii* and *Ch. floccifera*; *Ch. floccifera* is the most common in tea plantations; the most harmful on grapevines is *Planococcus ficus* and *Neopulvinaria innumerabilis*, which are controlled by *Cryptolaemus montrouzieri*; the worst pests against other fruit trees are *Quadraspidotus perniciosus*, *Parlatoria oleae* and *Epidiaspis leperii*.

Yu, G. & Tian, M. 1995. Notes on the genus *Cybocephalus* Erichson from China (Coleoptera: Cybocephalidae). Entomologia Sinica. Shensi 2: 35-38.

Notes: *Cybocephalus pangi* was collected from citrus with *Unaspis yanonensis*.

Zaman, A., Qader, M.A., Islam, S., Barman, A.C., Alam, M.S. & Islam, M. 1996. Effects of feeding of tukra affected mulberry leaves on economic characters of silkworm, *Bombyx mori* L. Pakistan Journal of Zoology 28: 169-171.

Notes: 'Tukra' transmitted by *Maconellicoccus hirsutus*.

Zchori-Fein, E., Faktor, M., Zeidan, Y., Gottlieb, H. Czosnek & Rosen, D. 1995. Parthenogenesis-inducing microorganisms in *Aphytis* (Hymenoptera: Aphelinidae). Insect Molecular Biology 4: 173-178.

Notes: Production of males in uniparental lines of two species in the parasitic wasp genus *Aphytis* was induced by rifampicin, and male sexual functioning was determined; *A. lingnanensis* (biparental) is a parasite of *Aonidiella aurantii*; *Aphytis lingnanensis* (uniparental) was originally collected from *Aonidiella* sp. and was reared on *Aspidiotus nerii*; *Aphytis melinus* (biparental and pest-resistant) was reared on *Aspidiotus nerii*; *Aphytis diaspidis* (uniparental) was collected on *Diaspis echinocacti*; *Aphytis* sp. was collected on *Duplacionaspis* sp.

Zhang, Z.Q. 1995. A new species of *Smaris* (Acari: Smardidae) associated with the Israeli pine bast scale, *Matsucoccus josephi* (Homoptera: Margarodidae) in Cyprus. Israel Journal of Zoology 41: 69-74.

Notes: This mite associated with *M. josephi* on *Pinus brutia*; feeding on the scale by this mite was not observed, but it is presumed that *S. pinus* could attack the scale because they are generalist predators and scales are available in large numbers; both *Anystis baccarum* and *Bdella* sp. have been observed feeding on scales.

Ziegler, R., Engler, D.L., Bartnek, F., Van Antwerpen, R., Bluestein, H.A., Gilkey, J.C. & Yepiz, G. 1996. A new type of highly polymerized yolk protein from the cochineal insect *Dactylopius confusus*. Archives of Insect Biochemistry and Physiology 31: 273-287.

Notes: A female specific protein was isolated from eggs and female hemolymph of cochineal insects, using density gradient ultracentrifugation, ammonium sulfate precipitation, and size exclusion column chromatography; this newly identified protein is the major yolk protein of *D. confusus*, and appears to be unique both in its subunit structure and in its polymerizing qualities.

Zimmermann, H. 1995. Underrated plant may become a money spinner. Plant Protection News (No. 42): 9.

Notes: Potential of the cochineal insect, *Dactylopius coccus* which produces the commercially sought-after red dye carminic acid, on *Opuntia ficus-indica* in South Africa.

Zuparko, R.L. 1995. New host record for *Metanotalia maderensis* (Walker) (Hymenoptera: Encyrtidae). Pan-Pacific Entomologist 71: 245-246.

Notes: *Phenacoccus madeirensis* was identified as the new host for *M. maderensis* in California.

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Interests: Systematics/Pseudococcidae/Eriococcidae/Diaspididae/Coccidae and others

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Interests: Diaspididae/Biology/Tropical Regions

Gopal, B. K. Raja, Dept. of Entomology, Agricultural College, G.K.V.K., Bangalore 560065, INDIA

Interests: Pseudococcidae/Ecology/Chemical Control/Biological Control/Mechanical Control

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Other Information: She gave a second address: INSUE, Univ. Nac. de Tucuman, Miguel Lillo 250, 4000 San M. de Tucuman, Argentina. Interested in all families except Diaspididae and Dactylopiidae.

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Interests: Biology/Ecology/Natural Enemies/Chemical Control/Biological Control/Mechanical Control/Economic Importance

Other Information: Chemical products of scale insects.

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Other Information: Regional interest - southeastern US and Caribbean.

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Interests: Collection Curator/Systematics/Soft Scales

Other Information: Since the breakup of DSIR into ten Crown Research Institutes in N.Z., the Systematics collections are held by Landcare Research, N.Z.

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Interests: Mealybugs/Systematics/Armored Scales/Ecology/Natural Enemies

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Interests: Growth Regulators/Pheromone Traps/Biological Control/Chemical Control/Behavior

Other Information: *Quadraspidotus*

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Interests: Systematics/Coccidae and others

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Interests: Laccidae/Mealybugs
Other Information: *Planococcus citri*, *P. pacificus*, *P. minor*, *P. litchii*, *Ceroplastes rubens*, *C. ceriferus*, *Kerria lacca*

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Interests: Greenhouse Pests/Economic Importance

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Interests: Ecology/Biology/Systematics/Biological Control/Natural Enemies/Diaspididae/Pseudococcidae/Coccidae

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Interests: Systematics/Biological Control

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Interests: Morphology/Biology

Other Information: Scale insects associated with ornamentals, fruit trees and shrubs; temperature and host plant effect on morphology and biology.

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Other Information: Since the breakup of DSIR into ten Crown Research Institutes in N.Z., the Systematics collections are held by Landcare Research, N.Z.

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Other Information: *Drosicha stebbingi*, *Drosichiella amarindus*, *Heterococcus graminicola*

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Interests: Systematics/Biology/Mealybugs

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Interests: Population Biology/Ecology/Herbivore-Plant Relationships/Competition/Biological Control/ Chemical Control

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Interests: Systematics/Diaspididae/Pseudococcidae/Morphology/Evolution

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Interests: Systematics/Diaspididae/Pseudococcidae/Coccidae/Morphology

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Interests: Coccidae/Eriococcidae/Pseudococcidae/Systematics

Other Information: Male scale covers and males of Coccidae

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Other Information: Provides many service identifications of scale insects for US quarantine

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Interests: Population Genetics/Parasitoids/Pest Status/Evolution

Other Information: Pests of vineyards and orchards; evolution of the reproductive and mating systems in coccids.

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Interests: Diaspididae/Bibliography on Diaspididae

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Interests: Biology/Behavior/Biological Control/Chemical Control/Mechanical Control

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Interests: Stictococcidae/Ortheziidae

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Interests: Systematics/Biology

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Interests: Biological Control/Pest Status/Homoptera

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Interests: Coccidae

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Interests: Biology/Systematics/Biological Control

Other Information: Coccinea of North America, particularly in area east of the Mississippi River

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Other Information: *Lopholeucaspis japonica*

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Interests: Systematics/Diaspididae/Beesoniidae

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